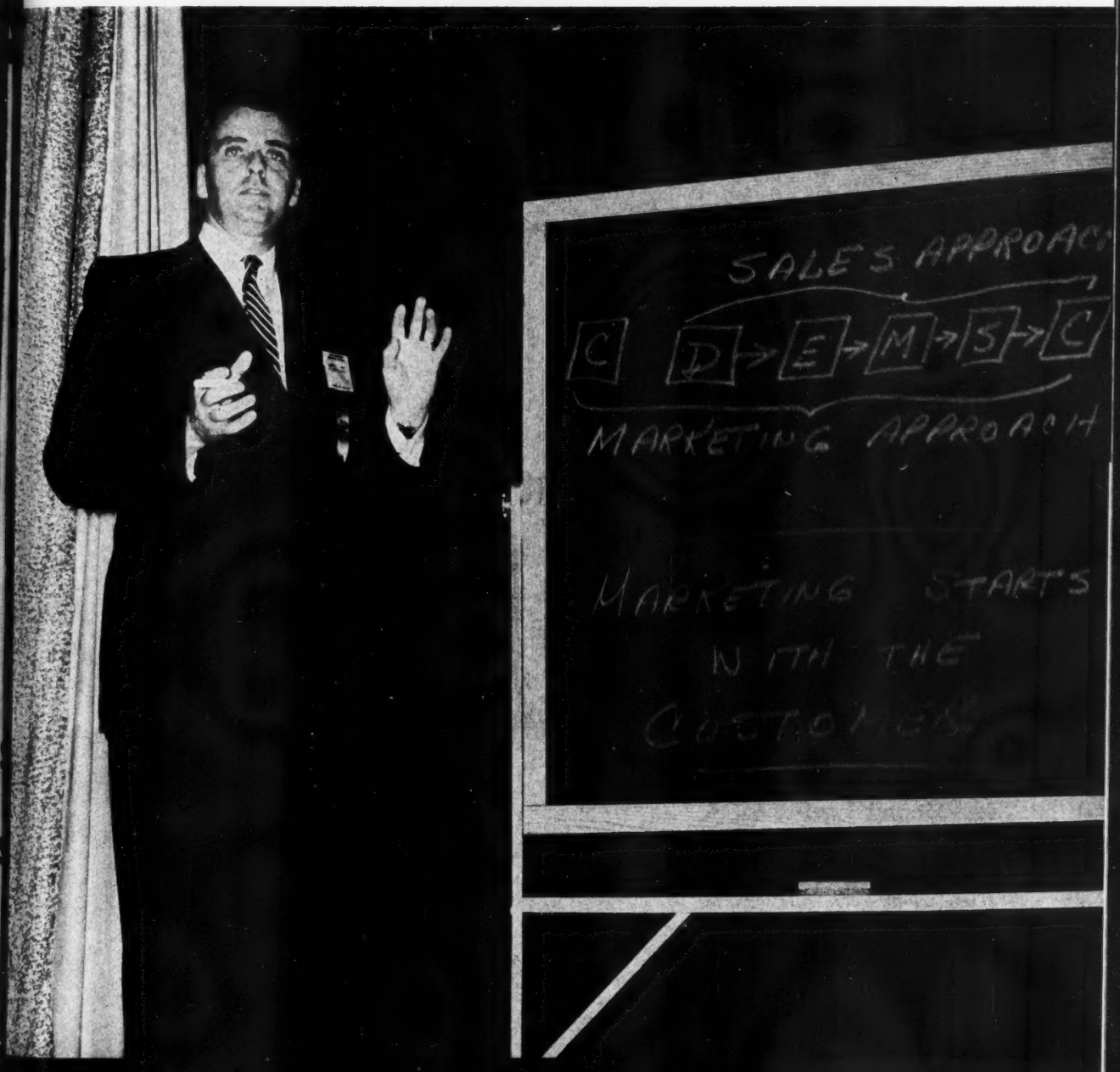
FARM CHEMICALS

December Volume 122 No. 12 50 Cents
Pioneer Journal of the Industry



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THEY MOVE MOUNTAINS TO SHIP CARLOADS

Cyanamid literally moves mountains of high-grade phosphate ore to ship carloads of Trebo-Phos . . . the triple superphosphate with controlled porosity.

To ship you the highest quality triple superphosphate, Cyanamid's "walking giants" scoop up twenty-four ton bucketfuls of high-grade phosphate ore at the rate of one ton every one and six-tenths seconds. To make one carload of TREBO-PHOS*, approximately 340 tons of ore are mined. This tonnage dwindles as the ore is washed, screened, graded and dried. Much of the remaining is used to make highly concentrated phosphoric acid which, when added to fine rock, makes triple superphosphate. Quality is checked at every stage . . . the result: a triple with controlled porosity.

Its characteristic: ammoniation rates as high as 5% without evolution of ammonia fumes, yet TREBO-PHOS particles will not take on excess amounts of moisture. The finished product is a dry, drillable, well-conditioned fertilizer. American Cyanamid Company, Agricultural Division, New York 20, N. Y. **TREBO-PHOS is American Cyanamid Company's trademark for its triple superphosphate.*

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TRIPLE SUPERPHOSPHATE

CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE

TOUGH MATERIAL SPECIALIST—

The Model 12B Michigan

CHROME and CARBORUNDUM ORE are unloaded fast by this 16 cu ft Model 12B. Owner: New York Central RR. Location: Jersey City.

Like all Michigans, the 12B has efficient all-Clark power train, including power-shift transmission, torque converter, planetary-wheel drive axle.

BROKEN GLASS reclaiming is the prime use of this Michigan Model 12B owned by Fairmount Glass Works, Indianapolis, Indiana.

BROKEN TILE, 400 tons per 8 hour day—that's the output of the two 12B's owned by Oconee Clay Products Co., Milledgeville, Georgia.

DOLOMITE, charged directly into red-hot open hearths, is this Michigan's tough, but successful assignment in this Illinois steel plant.

COKE, used by American Brake Shoe Co, Buffalo, is dumped into hopper. Note cramped quarters easily negotiated by the Model 12B.

FERTILIZER, tight-packed and hard to dig, yields to powerful Virginia-owned Model 12B. Note the heaped bucket, a "trademark" of all Michigans.

Your "tough jobs," too, are made to order for Michigan Tractor Shovels. Model 12B capacity is 3,000 lbs, buckets are available to carry from 6 to 27 cubic feet. Write for details.

Michigan is a registered trademark of

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Construction Machinery Division

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BPA
MEMBER BUSINESS PUBLICATIONS AUDIT

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FARM CHEMICALS

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THE COVER PICTURE

Comparing the classical (sales) approach with the marketing approach, Charles E. St. Thomas, St. Thomas Associates, drew a simple diagram at the first Farm Chemicals Marketing Seminar which shows that "marketing really starts and ends with the customer." See details on page 16. *FARM CHEMICALS photo by Vince Squazzo.*

Take those big preseason savings on LION® E-2 now!

It's the one and only ammonium nitrate you can safely store for big spring markup and extra profit! Lion E-2 is free-flowing when you get it... free-flowing when you sell it... no matter how long you store it!

NO CAKING... GUARANTEED. Lion E-2 prills won't break down, crumble or cake under the heavy weight of stacking in shipment or storage. E-2 is free of dust and fines ... not affected by extreme temperature changes or humidity. You and your customers can buy now, store safely until used. Guaranteed storage-stable.

EASY-TO-HANDLE BAGS. Lion E-2 multiwall bags are specially coated with Monsanto Syton®—the antislip agent that lets you stack Lion E-2 higher ... move it faster ... handle it easier. It helps you save time, work and space ... reduces material losses through breakage due to slippage.

TAKES LESS STORAGE SPACE. Lion E-2 has the greatest density of any ammonium nitrate on the market. It's less bulky ... takes 20% to 25% less storage space. It saves you needed floor area. It isn't necessary to spread out E-2 in smaller stacks. With E-2 you stack higher utilizing all available storage area, without fear of caking. You can *safely* stack E-2 higher.

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Inorganic Chemicals Division
St. Louis 66, Missouri

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NEW LION E-2

Always stores...

Always pours

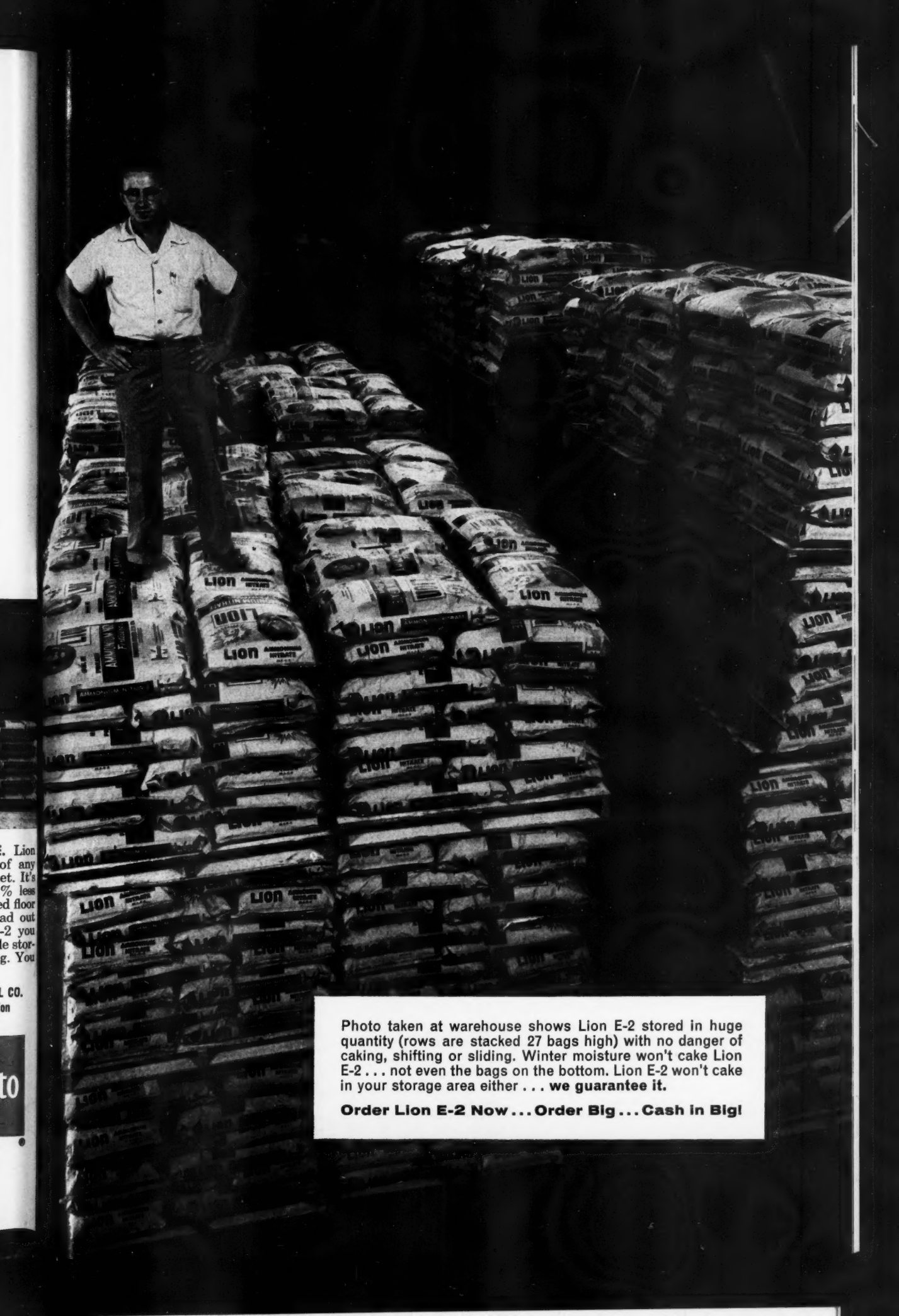

Photo taken at warehouse shows Lion E-2 stored in huge quantity (rows are stacked 27 bags high) with no danger of caking, shifting or sliding. Winter moisture won't cake Lion E-2 . . . not even the bags on the bottom. Lion E-2 won't cake in your storage area either . . . **we guarantee it.**

Order Lion E-2 Now . . . Order Big . . . Cash in Big!

WHAT'S DOING IN THE INDUSTRY

F
C

DOANE COMPLETES SECOND HERBICIDE MARKETING STUDY

Probably the most comprehensive marketing study on purchases and applications of herbicides has just been completed by the Marketing Research Div. of Doane Agricultural Service, Inc. Data used in the study were obtained from the 2200 member Doane Countrywide Farm Panel representing over 90 per cent of total farm purchasing power. This was the second annual study of the farm herbicide market, originated by the Doane organization. This service is available to individual companies on a subscription basis.

Among the findings: About 57 per cent of commercial farmers used herbicides of some type in 1959 while only 45 per cent used herbicides in 1958. There was more cotton, corn, hay, soybeans and rice treated in 1959, but less grain sorghum and small grains. Almost twice as much cotton was treated in 1959 as in 1958.

Corn acreage accounted for more acreage treated than all other crops combined, and the acreage of corn treated with pre-emerge in 1959 was more than twice the acreage similarly treated in 1958.

Investment by commercial farmers in herbicides increased from 66 cents per treated acre in 1958 to almost 81 cents per treated acre in 1959.

Sales of some brands and companies remained constant or even declined, despite the fact that there was an overall increase in herbicides used in 1959 over 1958. One manufacturer for example had a 1.56 per cent share of the total dollars spent by commercial farmers for herbicides in 1958, but received only a .53 per cent share of the market in 1959. Another manufacturer declined from 1.08 per cent in 1958 to .33 per cent in 1959. Co-op brands accounted for about 9 per cent of the 1959 sales of herbicide chemicals.

Farmers' recognition of the names of the primary herbicide manufacturers ranged from a high of 72 per cent recognition to a low of 5.6 per cent. Of the farmers who didn't use herbicides in 1959, almost 40 per cent thought they should have. On the other hand, almost 71 per cent of the non-users are undecided about next year's use, while 23 per cent said they will use herbicides in 1960.

CENTRAL CHEMICAL BUYS GREEN-LEAF PLANTS

Purchase of the Green-Leaf Fertilizer Co. plants at Lockwood, Ohio, and Andover, Ohio, has been announced by Central Chemical Corp. The firm reports that it will add a complete line of pesticides at these plants and will serve the Lake District from Cleveland, Ohio, to the New York line.

Central has just completed an expansion program at its Hagerstown, Md., plant which will double its capacity for grinding of 75% DDT wettable powder and other related air-mill products.

STAUFFER ELECTS OFFICERS

Directors of Stauffer Chemical Co. have elected August Kochs vice chairman of the board of directors and Rothe Weigel a senior vice president of the company and president and general manager of the Victor Chemical Works Div. Before merger of Victor into Stauffer on November 1, Kochs was chairman of the board and Weigel, president of Victor.

CSMA MEETING PROCEDURES AVAILABLE

Proceedings of the 45th mid-year meeting of the Chemical Specialties Manufacturers Association have been published in a 204-page book. Prices are $7.50 per copy, postpaid in the United States and Canada, and $8.00 per copy, postpaid to other countries.

Meeting Highlights

THIS MONTH:

Chemical Specialties Manufacturers Association

Hotel Mayflower, Washington, D. C.

December 7. Meeting of the board of governors and committee meetings of the six divisions of which CSMA is composed.

December 8. Among the division meetings will be that of the Insecticide Div. A symposium on non-agricultulral spraying equipment will highlight its morning session. Philip Hauser of Root-Lowell Mfg. Co.'s National Steelwares Div. will be moderator. Titles of papers and their authors include "Household and Dairy Sprayers," by T. B. Welsh of Gulf Oil Corp.; "Mill and Industrial Sprayers," by W. L. Brahm of B&G Co.; "Lawn and Garden Sprayers," by David Lewis, H. D. Hudson Mfg. Co.; and "Sprayers for Parks and Recreational Areas," by the Superintendent of Capital Grounds.

December 9. "Insect Resistance," will be reviewed by Robert H. Nelson, secretary of the Entomogical Society of America, at the Insecticide Div. session. Morton Beroza of USDA will speak on "Recent Developments in Insect Attractants." T. Carter Parkinson, McCormick & Co., will speak on a marketing subject.

NEXT MONTH:

Agricultural Aircraft Association, Inc.

El Mirador Hotel, Palm Springs, Calif.

January 14. The convention begins with an "Airshow" type demonstration of aircraft, helicopters and equipment.

January 15. The morning session will be devoted entirely to a "Problem's Panel." Members will be experts in all fields pertaining to agricultural aviation: Insurance, claims, legal, chemical, engineering, safety, regulations.

The afternoon session includes presentations by Claude Finnell, Imperial County Agricultural Commissioner; Lloyd Nolan, ag operator; Dr. Ralph Fogleman; and Robert Rollins, chief of the California Bureau of Chemistry.

January 16. A closed business meeting to establish 1960 business policy and to elect new directors and officers. John Neace, Neace Aviation, will be luncheon speaker, on "The Price of Security is Freedom." Officers and directors will be introduced.

NOW you can formulate high concentrate wettable powders at low cost with MICRO-CEL

SUBSTANTIAL FORMULATION SAVINGS

Micro-Cel*, a new line of synthetic calcium silicates, has extremely high absorptive properties. It is this remarkable capacity for absorption that makes it possible to prepare wettable powders with higher concentrations of dry, viscous or liquid poisons. Micro-Cel's absorption also means that more lower cost diluents can be used. Thus high strength formulation costs are now cut to a new low.

REMAINS FREE-FLOWING—MEETS STORAGE TESTS

With Micro-Cel, these high concentrates will remain in a free-flowing state even after prolonged storage. This is particularly important in producing poisons for the export market.

In addition, suspension values after storage of 1.5 to 2.0 I.C.A. have been achieved in 75% DDT wettable powders, based on Micro-Cel. This is more than adequate for storage conditions encountered in most tropical countries.

DEVELOPED BY JOHNS-MANVILLE RESEARCH

Micro-Cel is another development of Johns-Manville Research. Combining high absorption, large surface area, small particle size and excellent dry flowability, it offers a unique combination of properties for insecticide formulation and other process needs.

Sample quantities and carload shipments are now available. Write for further data and sample formulations for poisons of interest to you. Or ask a Celite engineer to help you adapt Micro-Cel to your particular requirements and specifications.

*Micro-Cel® is Johns-Manville's new absorbent-grinding aid designed specifically for the insecticide formulator.

Johns-Manville

MICRO-CEL

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Please send ☐ further information; ☐ samples of Micro-Cel. I am interested in using Micro-Cel with the following poisons:

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☐ Please have your local representative contact me.

Name_____ Position_____

Company_____

Address_____

City_____ Zone_____ State_____

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- **Phosphate Rock**
- **Triple Superphosphate (Coarse, Granular, Run-of-pile)**
- **Phosphoric Acid**
- **Muriate of Potash (Coarse, Standard, Granular)**
- **Sulphate of Potash**
- **Sul-Po-Mag**

Manufacturing and Technical Service
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Customer Service
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Marketing Services

INTERNATIONAL FULL ORBIT SERVICE

Movies and other visual aids demonstrated most advanced selling methods.

Many of IMC customers, faced by a condition of over production and under consumption of their products, are welcoming the complete services of IMC in helping their salesmen sell fertilizer on a basis of quality and performance.

ACCOMPLISHED

MAN WITH A MISSION

More than five hundred representatives of the fertilizer industry received two-day briefings on how to use proven sales techniques in day-to-day selling.

Answering the demand of its customers for direct sales assistance, IMC has just concluded a series of two-day meetings aimed at making sales calls more effective for the fertilizer industry. Five hundred and sixty-four industry representatives — salesmen, sales managers, general managers and presidents — attended IMC-sponsored sessions in ten key cities around the country. Almost every conceivable visual aid was employed to dramatically convey practical ways of stretching selling time — exploiting buying motives — appraising the market — searching out potential customers — credit handling and closing the sale. Typical comments received at conclusion of the meetings were —

"If we apply what we heard, this year's sales will set new records."

"This was an invaluable meeting; we needed this kind of help badly."

"Without doubt, this was the most stimulating meeting I ever attended."

"Ideas of this kind will put new life in our industry."

IMC is eager to help you realize the full sales potential of your marketing area. Your IMC representative is trained and equipped to help you with your *total* selling problem. His is a mission of *total service* to his customers. Just give him a call!

Products for growth*

50 IMC 1909 1959

*Trademark

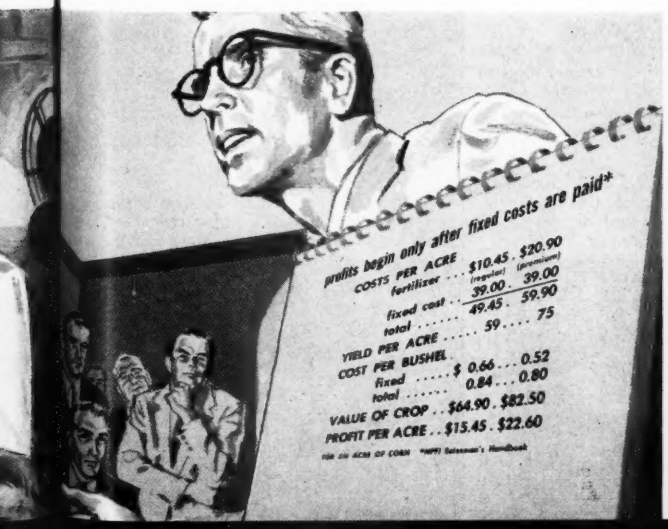
AGRICULTURAL CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

78-59

Sales logic is explored and ways to use it most effectively explained.



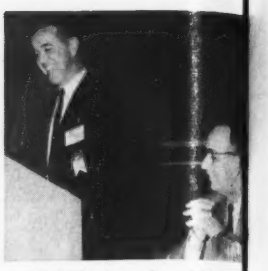
Careful analysis of the customer enables sales story to be fitted to his particular interests.

Sargent: Many sales managers don't realize the advantages of sales plans.

Hanover: Market research can only act through other people.

Lazo told audience how to appraise their total marketing program.

Parseghian: The need for market research arises from need for information.



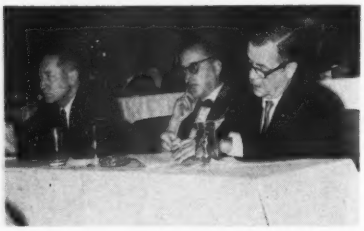
Cohill: Introduced Phillip Alampi, N. J. Sec. of Agri at the first FCMS.

FCMS in Action

See pages 16-19 for a full report on Farm Chemicals Marketing Seminar

C. Milton Gross, U.S. Steel and Stewart D. Daniels, Monsanto Chemical Co. enjoy the coffee break offered at FCMS.

L. Schrader, Standard Oil (Ind), K. W. Cross, Schrock Fert and Bill Sargent, Pfizer & Co. share the interest shown at FCMS.



Attentive is the word for O. Steinen and A. M. Stover of Naugatuck Chem. Div. while E. Baillie, Pittsburgh Plate Glass makes notes.

Roger W. Roth of Velsicol Chemical Corp. and L. G. Gemmell, of Geigy Agricultural Chemicals make preparations for the next session.

In between sessions, we find J. R. Glatthaar (l) Monsanto Chem. Co. discussing a point in question with F. Tucker & D. E. Matthews of Swift.

The "Task Force" of Miller Chem. & Fert is symbolic of the interest and attention shown at FCMS. Bill Wilner, L. Fries and J. Dyer.

Richard Giovine, Commercial Solvents and L. S. Kaniecki, Tennessee Corp. enjoy a pause in the FCMS.

L. F. Fries, Miller Chem. (c) and E. M. Billings, Inland Chem. (r) share equal interest in remarks from C. A. Leonard, Monsanto Chem. Co.

Moyle Williams of NPFI (l), Russell Kruetzman & P. Bernard of Doane Ag Service exemplify the interest shown at Farm Chemicals Marketing Seminar.

Paul Stubbe, Atlas Powder Co. and Leslie Reed, Chipman Chemical Co., Inc. reflect the humor and informality of the FCMS.

WASHINGTON VIEWPOINT

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▸ *A milestone in the drive to straightjacket farm chemical use: The cranberry ballyhoo*

▸ *Fertilizer pay-off on Secretary Benson's farm policies is due in the 60's*

The cranberry ballyhoo logs another milestone in the *irreversible* drive to straitjacket the use of farm chemicals. When viewed against the background of widespread suspicion of chemicals in the daily diet, Secretary Flemming's action can mean nothing less. *A super Food & Drug Administration* is unmistakably emerging. Legislation over the past few years, culminating in the Delaney amendment, has provided increasing control authority for FDA. The common complaint within that agency, and from without, has been that FDA does not have sufficient inspection personnel and scientific laboratories, to adequately meet the requirements of the new laws. This is further underscored by the fact that the FDA workload has increased many-fold by the new chemical discoveries and applications of recent years.

This then, is the likely upshot of the cranberry stunt—and is the main reason for it. Some dramatic event was needed to point up the contention that FDA was being swamped by the progress being made in chemicals. Cranberries, haplessly, seemed to offer the perfect opportunity.

The cranberry issue strikes at the very heart of the pure food and drug laws. That is, these laws and their regulations are based on the assumption that farmers will use chemicals properly—and thus keep dangerous residues from food—if they are given proper instruction and warning. They depend upon farmer compliance for their effectiveness. The "human element"—error in farmer judgment—supposedly is compensated for by the FDA inspection network.

This policy has now been tried. Aside from the cranberry incident, the classic example is in milk residues. For one thing, FDA has been educating the farmer for 5 years to keep penicillin (from mastitis ointments) out of the milk supply. There continues to be almost 5% of the milk supply containing this antibiotic. Similarly, farmers have been "educated" to keep chorinated hydrocarbon and other pesticide residues from milk. Most recent FDA survey shows that 33% of the milk supply still contains some trace of DDT and other chlorinated hydrocarbons.

This means: Congress will be looking for ways of plugging this basic weakness in the law. The obvious way, and the one favored by many in FDA, is to develop a big "police" force of inspectors. It now has only 400. This is an easy out, except that it costs a lot of money. Another method is licensing of farmers for use of specific chemicals. This is more difficult, and may bring on a temporary moratorium on the use of specific chemicals until the job of licensing is completed. Either way, FDA stands to get bigger.

Changes in laws covering the manufacturing side are less likely to develop—unless the Delaney cancer amendment is spelled out in more detail. Among the changes possible, of course, is a requirement for more research before applications are approved.

How successful the drive will be is anybody's guess at this time. But the HEW now is fully committed to seeing it through. Cranberries put the HEW and FDA more on the spot than they do the chemicals or agricultural industries. A precedent has been set, and Congress will expect a follow-through. Against the background of actions these agencies *didn't take* in the past, the only conclusion is that this is the way Secretary Flemming wanted it.

The cranberry action of course can be defended on grounds that the "offending" weedkiller was carried in the berries at the height of the eating season in potentially widespread shipments. This constituted an unknown menace to public health, and justified some action.

Among other things, this defense looks hollow when viewed alongside these other facts:

(1) While aminotriazole has produced tumors in the thyroid of some rats at high dosages, there are reports that the tumors disappear when the weedkiller treatment is stopped. This would indicate that the chemical in question is not a carcinogen.

(2) Estrogenic growth-stimulating compounds, such as stilbestrol, have produced cancer in laboratory mice. Still, they are permitted for use in most livestock, despite the Delaney amendment. Furthermore, FDA tests have detected residues of stilbestrol in liver and fat of chickens.

(3) Chlorinated hydrocarbons, and other pesticides, continuously show up in FDA tests on milk.

But while these facts tend to cast suspicion on Flemming's motives, they also stand as a warning to the chemical industry and to farmers. If Flemming follows through on the policy set in the cranberry case, a crack-down on other residues is coming.

Congressional action in the forthcoming session will hinge on lipstick bills introduced this year. The Hill Senate-passed version does not contain a cancer clause, prohibiting the use of chemicals which may produce cancer in humans or animals. But a House bill does include the clause.

A congressional hearing is expected on the House lipstick bill, particularly in view of Senate passage

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What's Coming Next Month

When someone asks you "How's business?" do you suddenly try to switch the subject to the cranberry situation or to the 'Quiz' scandals? For the past 12 months FARM CHEMICALS has attempted to help you appraise your marketing effort and the potential which exists. We hope you have *profited* from some of the ideas presented on these pages with our new Marketing Approach. Also, some will remember 1959 as "the year FCMS (Farm Chemicals Marketing Seminar) was born."

As we approach our January 1960 issue, we have on our editorial desk the "makin's" of a bang-up issue. Take a look at some of the articles that will lead off our 1960 series.

■ MARKETING IN THE 60's—II

The second in our series will attempt to show you how to become a constructive critic of your present marketing program. The author presented his ideas at the first FCMS sponsored by this magazine, last month. Example: 10 criteria for measuring your total performance in marketing. An attempt will be made to show you the possible trouble areas in your program—and how to solve them. Many industry people who attended the first FCMS thought this presentation topped them all. We know you'll profit from it.

■ SOLVING AIR POLLUTION PROBLEMS

Briefly, this is a report on the important factors essential to adequate control of various types of fertilizer pollutants.

■ HOW TO GET THE ORDER

What are the "runaway favorite" tactics used to make effectual requests for the order? The author of our popular "Successful Salesmanship" series reviews the most persuasive methods.

WASHINGTON VIEWPOINT

of the Hill bill without hearings. Inevitably, the use of chemicals on food will be brought into the expected lipstick hearings.

How far Congress goes, assuming hearings will be held, will depend largely upon the kind of public pressure which is brought to bear.

The fertilizer pay-off on Secretary Benson's farm policies is due in the decade of the 1960's. Among the effects of his relentless squeeze-out-the-marginal-farmer program will be a larger permanent fertilizer sales base. Certainly, the rising fertilizer market can't all be attributed to the Benson plan—but federal programs are creating an unusually favorable climate for sales growth.

Benson's service to the fertilizer industry, and to industry generally, of course, is the stimulation provided for growth of larger farm units. The primary stimulation comes from the pressure of constantly sliding price support levels at a time when surpluses are pressing down on prices anyway.

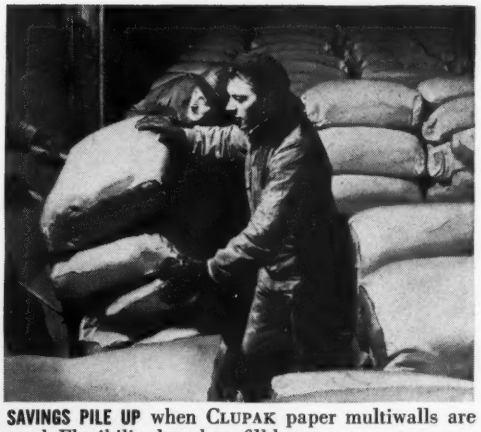
The potential for a bigger permanent sales base can be gauged by two developments: (1) More than 3/5 of farmland purchases now are for farm enlargement, and the percentage is expected to increase. (2) There are somewhat more than 2 million "marginal" farmers, who, the government believes, must be forced out of active production in order to have a totally efficient farm plant. If the trends continue, as they are expected to, more than half the land sales made by marginal farmers will be made to more efficient producers.

This means: Millions of acres which have been farmed at minimal efficiency levels will be bought by efficient farmers who will maximize their production. That is, where little or no fertilizer was used before, fertilizer applications can be expected to soar toward levels recommended for most efficient use. These millions of acres will become part of the permanent sales base for fertilizer.

Benson is not letting up on his push to force marginal farmers out of production. It is implementation of his theory that the surplus farm problem cannot be solved until these farmers are out of production. He has re-affirmed his intention to reduce price supports still further. This makes it an impossible situation for the marginal producer. Benson goes further, however. He is advocating a nationwide network called the Rural Development Program through which farmers squeezed into unemployment can find work off the farm.

Not all land forced out of production will be immediately available for the fertilizer pitch. This is because of the Conservation Reserve Program, which permits farmers to retire their land up to 10 years at government expense. Benson wants this program expanded beyond the 28 million acres now signed up. However, when these contracts start running out, beginning in mid-1960, the land involved will be available for sales to other farmers. This is likely to give another spurt to the expanding fertilizer market at that time.

TWENTY-TON LOAD aboard trailer fails to bother multiwall sack made with CLUPAK kraft. Patented, built-in stretch absorbs shock as wheels pass completely over. Sack contains 100 pounds of abrasive sand-blasting grit, found difficult to package prior to use of CLUPAK paper multiwalls.



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CLUPAK TRADEMARK is your assurance the bag paper meets the most rigid of shipping requirements, even when CLUPAK paper toughness makes possible lower total basis weight. Look for the trademark.

NEW PAPER WITH REVOLUTIONARY "*TOUGHNESS*" CUTS MULTIWALL BREAKAGE...AND COSTS, TOO!

BETTER PERFORMANCE, LOWER COST! CLUPAK Extensible Paper opens a new era in paper... makes it virtually a new material, with unlimited applications. For CLUPAK paper has built-in *stretch* or extensibility which lets it absorb the shocks and strains that cause ordinary paper to rip, tear and puncture. The result is a new dimension in paper—*toughness.* In multiwall sacks, CLUPAK paper toughness delivers far better performance . . . often at lower cost, by permitting fewer multiwall plies and a net saving in total basis weight. And CLUPAK paper *flexibility* can mean additional advantages—faster filling, easier handling and stacking.

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Marketing

THE BATTLE for 1960 Sales is on! What do you estimate your share of the market will be next season? Do you know what your share is *now?* What type of methods do you plan to use to increase it? *How* do you plan to "beat your competitor"—through sales or profits? What are you doing about *re-training* salesmen for the 1960 season?

These are some of the vital questions that wide-awake sales managers are concerned about this month. They also happened to be among the many subjects discussed at the first annual Farm Chemicals Marketing Seminar, conducted by this magazine at the Barbizon-Plaza hotel, New York City, November 16–17.

Excellent addresses by qualified authorities and thought-provoking question-and-answer sessions, following each of the three panels, brought out alarming statements like these:

▶ Seventy-three per cent of point-of-purchase materials in the oil industry are just so much wasted effort, according to a recent survey.

▶ Fifty per cent of the salesmen in this country are only 10 per cent effective. (Not the fault of salesmen alone—but many factors contribute to this alarming figure).

▶ If you haven't reorganized your staff operations since 1955 they're out-of-date!

▶ More and more salesmen find themselves in the embarassing situation of being less informed about the product they're selling than many of their buyers!

The first morning session's general subject was "The Meaning of Marketing."

"MARKETING—A POLICY OF PROFIT INSURANCE"

"Our capacity to produce is almost limitless and ever-increasing," Phillip Alampi, secretary of agriculture in New Jersey, told the FCMS audience in his opening address. "Marketing efforts and facilities must keep pace if we are to maintain a healthy agriculture."

He explained how New Jersey poultry farmers "taxed themselves" (one cent per hundred pounds) to provide a promotion and merchandising program to meet the challenge of new competition which was making serious inroads upon markets formerly believed to be "secure."

Results: 1) increased demand, 2) expansion of market outlets for New Jersey eggs, and 3) the holding of their traditional markets. Other benefits derived were a new interest in establishing a State Seal of Quality cartoned egg price, a shipping point price indicative of the high quality pack—and contributions toward the work of the Poultry and Egg National

First Farm Chemicals Marketing Seminar

is a resounding success. Here is a report of . . . .

FCMS in Action

in the 60's

Board to promote egg consumption at the national and local level.

"Truly sound marketing based on rigid quality control of the product being offered to the public will become a policy of profit insurance," Alampi assured his audience.

Three positive characteristics about the farm chemicals industry which ought to bring a higher return on investment in the "golden sixties," according to Charles E. St. Thomas, St. Thomas Associates, are:

1) An abnormally high growth rate. "It's a pretty good horse to have your cart tied to."

2) Market place competition is *healthy*.

3) Product innovation is going along at a fast clip, due to great emphasis on research.

"If I were to describe in one word the farm chemicals industry, that word would have to be *opportunity*," he continued.

WHAT IS MARKETING?

"*Marketing is a way of managing a business so that each critical business decision* (those critical decisions made by engineering people, by manufacturing people by financial people, and so forth) *is made with a full and prior knowledge of the impact of that decision on the customer*," according to St. Thomas.

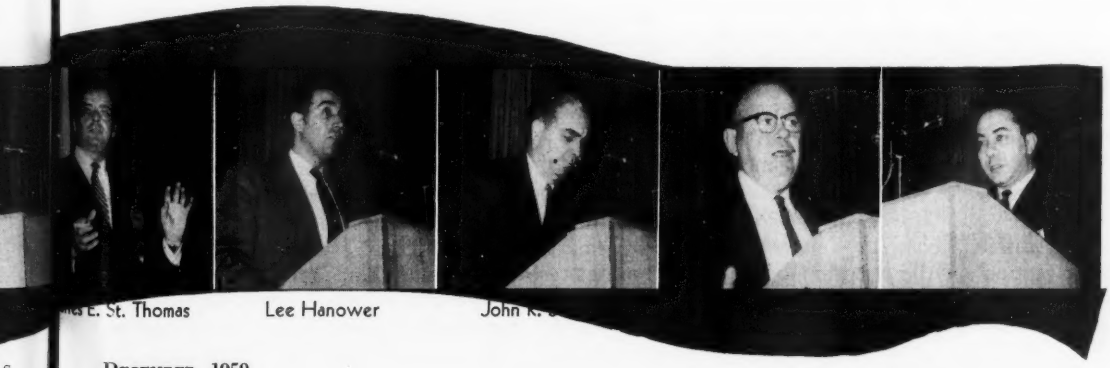
Comparing the classical (sales) and the marketing approach in new product development he drew a simple series of blocks on the blackboard.

The "blocks" were D(esign), E(ngineering), M(anufacturing), S(ales), and C(ustomer).

"In the case of the classic approach we find a chain-like reaction in which those people responsible for the design aspects of products put together their recommendations which, in turn, are given to engineering. Then, after the engineering work is completed, the manufacturing people produce the product. When made, the product is given to the sales people who are then told to sell it to the customer. In over-simplification, the process starts with design, and moves successively through engineering, manufacturing and sales toward the customer," he explained.

"Now take the marketing concept. You will find a change right at the *beginning*. The process now *starts* with the customer rather than *ends* with the customer. The business that accepts the marketing concept first finds out in just as specific terms as is possible what it is that its customers need and want, and what the customer is going to need and want.

"*Then* this information is given to the design people who design the product and, ultimately, to manufacturing people who produce the product. Finally, this product which has been conceived from the start with the customer's needs first in mind is given to the sales people who in turn take it to the marketplace



...s E. St. Thomas Lee Hanower John R. ...

with the foreknowledge that the product has been designed, engineered and manufactured in such a way that it is predetermined to be right for the customers."

St. Thomas went on to say that "a sales-oriented type of business almost of necessity emphasizes volume rather than profit. "Too often this is *profitless* volume."

"*With the classical or sales approach,*" *he continued, "the customer exists for the company; with the marketing approach, the company exists for the customer.*"

Is the so-called small business today facing greater competition than it has faced in the past?

St. Thomas answered this with a definite *yes*. He said there were three different types of competition with which the farm chemicals industry has to contend in 1960:

1) *Product vs. product*—This is the competition of *one brand* vs. *another brand*.

2) *Function vs. function*—This is the competition of, for example liquid vs. dry fertilizer. In effect, this is really the competition of one branch of technology vs. another.

3) Cross product . . . this is the competition for a dollar, say, to be spent on fertilizer vs. the same dollar which could be spent on a tractor . . . or a pesticide vs. a new family car or a fur coat.

St. Thomas said that our customer is *shifting* and *changing*, many times in ways which are not always discernible! There is less reliance on the *personal* factor in sales, he pointed out.

"Because of personnel changes and the march toward product standardization," he said, "the personal relations factor in sales is playing a decreasing role of importance."

Thus, *top salesmanship* no longer is enough. The customer has a greater variety of competitive choices than ever. Customer knowledge is far greater than it was, say 5 or 10 years ago. *In fact, sometimes the customer knows more about the product than the seller does*!

The customer is finally becoming sophisticated enough to downgrade the *price alone* concept. There are now more factors considered, such as pride of ownership, delivery, installation, service, terms of payment, etc. After adding up all these factors, he divides by price!

How does a company get started down the marketing road? Here are the four basic decision-making steps to go through—each having its own special place in the logical sequence of actions which are necessary to make certain that the implementation of marketing correct for the particular company concerned, St. Thomas said.

▶ The *do-it* decision. After considerable analysis and study of what the marketing concept is, the first move is simply to really decide to adopt the concept and apply it to the business.

▶ The *assessment* decision. Marketing is adopted to do a specific task within a company—namely, to focus each business action on the needs and wants of the customer. Decisions on how the company organizes and staffs to do this must be based upon foreknowledge of how well the business is currently doing in satisfying its customer needs.

▶ The *what to be* decision. If we are to accept marketing as a new approach to business management, then it becomes logical to assume that the time the concept is undertaken probably is the ideal point in time for a company to do a little basic soul-searching and come up with some fundamental answers to questions like these (if it does not already have the answers):

1) *What* is it that the company is really trying to be (in specific terms)?

2) *How* is the company going to be what it wants to be (in specific terms)?

3) *What kinds of people* will give the company the best opportunity to be what it wants to be (in specific terms)?

4) The *how to be* decision. This is the *payoff* decision, the *action* decision. It splits out into two closely-related, but entirely different, aspects: organization structure and people.

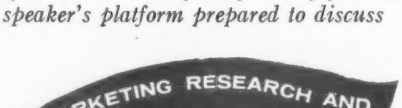
St. Thomas emphasized that each company should know the best possible structure for the business which will enable it to put the marketing concept to work.

As for people, he said he agreed with what Alampi had stated earlier concerning getting marketing to function effectively:

"Most of the problems are *people* problems."

Future speakers also elaborated on this all-important point.

The afternoon session of the first day found three men on the speaker's platform prepared to discuss



Manuel H. Parseghian, account executive for National Analysts, discussed *marketing research and its importance to farm chemicals manufacturers.*

Parseghian also stressed the difficulty in measuring the effect of MR in dollars and cents. He said it was "practically impossible."

"It forms a basis or decision of what to do," he explained.

"It's important for management to know how company personnel will be affected by management decisions. Management doesn't have its 'fingers on the information.' Thus there's a communications problem here. MR completes the communications link. It's a planned effort to generate and gather information. The need for market research arises from the need for information."

Lee Hanower, director of market research for Nitrogen Division, Allied Chemical Corporation, explained *how to initiate a market research program.*

First, he said, in establishing a market research program you must recognize the need for planned market research in your company. There is more to this than meets the eye, he was quick to point out.

"Market research is a funny beast as a corporate

function," he said. "When you pay someone to do market research for you, you naturally expect to get back a return on this in the form of increased profits. But how does the market researcher help to increase profits? *He can't do it directly*," he continued.

"*Market research can help top management or marketing management to make better decisions in the marketing area.*"

Next, find a good man and assign the responsibility to him. He said that he doesn't advise against "hiring a real expert" if you can afford it and the potential profit improvement is good, "but this may turn out to be a luxury in the small or medium sized fertilizer manufacturing company."

"It is perfectly possible to take one of your own men right now and relieve him of some of his present functions to give him some time to learn market research and train him to do an effective job," he added.

Caution: Your man must be trained in market research techniques. Hanower said this is not too hard.

"There are a number of excellent sources of training and information," he went on. "I would suggest that one of the first things your new man ought to do is to visit the market research departments of a few of your material suppliers."

He stressed the point several times that *market research can only act through other people.*

The crucial point in this whole process, he said, is to find some way to make the market research function a part of your marketing team. He concluded by saying:

"You can't expect MR to produce a program without knowing the problems. MR must be problem-oriented."

How do you adapt research to sales planning? John Sargent, partner in charge of the marketing division of Cresap, McCormick & Paget, in discussing this subject said:

"We believe that many sales managers do not recognize the unusual opportunity offered them by the annual sales plan and forecast," he said.

He listed four important ways in which this activity can pay off for the sales manager:

1) It gives the sales manager an opportunity to get action on many key issues which may represent problems.

2) It generally has the effect of getting everyone on the sales team.

3) It has desirable effects with respect to what might be called "internal public relations."

4) It makes it possible to demonstrate leadership.

As regards the short-term or annual sales plan, he continued, there are at least *10 items* to be considered in formulating a good program, including:

1) Size and trends of the markets for your products.

2) Your present and past shares of these markets.

3) Size, caliber and location of the field sales force (including salesmen, district managers, regional managers).

4) Size, caliber and availability of the headquarters sales organization (and other executives).

5) Amount and caliber of advertising and promotion.

6) Competitive conditions of all types.

7) Prices and trade discounts.

8) Product line: condition of present items, any new products for introduction.

9) Distribution channels: dealer distributor and jobber situation.

10) Product availability: manufacturing capacity, deliveries, warehousing.

Sargent explained in detail the 10 items above which must be considered in an annual sales plan and indicated the part market research plays in each.

The opening address on the third and final panel, "Analyzing Your Present Product Distribution Program" was presented by L. S. Kaniecki, manager of chemical sales, Tennessee Corporation.

Explaining the *responsibilities of the sales manager*, he said primarily "it is the job of building sales." Some of the other broad responsibilities he listed are: marketing and research problems, selection and training of salesmen, advertising and sales promotion, modern concepts of human relations, and keeping abreast of federal and state laws affecting business practices.

He then went into a rather extensive explanation of each of these areas, plus a few specific areas such as sales meetings, sales forecasting, staying abreast of production problems, establishment of sales territories, sales budgeting, packaging and shipping problems, credits and collections, establishment and maintenance of numerous sales records, and customer contacts.

Vernon H. Van Diver, Sr. publisher of Brad-Vern's Reports discussed automated mechanics of marketing and its application to the use of farm machinery and fertilizer in growing corn. He showed, for example, how a chemical company increased its share of the market through intensified advertising. This company, said Van Diver, "never has had a sales force traveling among its customers and prospects. Their efforts to make sales are largely dependent upon advertising in business papers."

One of the outstanding contributors to the FCMS program, both as speaker and leader in discussion, was Dr. Hector Lazo, chairman of the marketing department, Graduate School of Business Administration, New York University, and managing director, Marketing Counsellors, New York. Because his assignment was to prepare an address which would "wrap up FCMS in one big package", so to speak, which he did in an admirable manner. . . . this outstanding presentation will be presented in its entirety in a sequel to this article next month.

As part of our "Farm Chemicals Marketing in the 60's" it is entitled: "How to Be a Constructive Critic of Your Present Marketing Program." Watch for it!

HOW TO PICK Business from your Accounts

By TED POLLOCK

As a salesman, what would you give for a list of Grade A, pre-sold prospects known to be in the market for your products or services?

Your eyeteeth? A week's income?

Save 'em. You already have such a list! Just thumb through your copies of the orders you've filled out during the last 12 months and there it is—as rich a source of high-potential leads as you could dream of.

Think of it! A list as long as your arm of prospects who already know you, your products and your company! Men whom *you* know! New business where you and your company enjoy ready-made acceptance!

Brand new sales from your present accounts, one of the most neglected secrets of new-business getting, is simply a case of spotting or—more frequently—*creating* new reasons for buying. Its requirements are simple: alertness, curiosity, a little imagination.

Tested ways and means of scooping up the treasure at your feet—new business from your old accounts—herewith:

Sell your full line. Many salesmen shortchange themselves by *assuming* that their customers are not on the market for additional products when, in reality, the customers just don't know what else is available from them. Others, yielding to the temptation to take the course of least resistance, push only the "easy movers." The result: a comfortable—but costly—selling rut.

Bring out the rest of your line, though, and you may find a large untapped market right under your nose.

Thus, salesmen for The Nestle Company, food manufacturers, systematically sell their complete line—and, consequently, more aggregate volume—by featuring certain products in rotation every six weeks.

"Since we can't hope to cover all our products during any one sales call and still hold the customer's attention," explains assistant sales manager George A. Perlberg, "we 'sell by cycle.' That is, we divide our line into 'primary' and 'secondary' items. 'Primary' items are featured all year long; 'secondary' items change every six weeks. In time, all our products get their fair share of exposure in the marketplace and our customers grow familiar with our full line."

Salesmen for Masback, Inc., hardware wholesalers, sell more by "hooking" one product to another in their presentations.

"A dealer who orders paint, for example," says vice-president Phil Spiegel, "automatically becomes a prime prospect for brushes, rollers, pails, scrapers and a dozen other products. Our men are trained to point out tie-in sale possibilities whenever possible—something every retailer appreciates. Why shouldn't they? It means bigger profits for them."

Agents for Aetna Casualty and Surety Co. point out to clients that by dividing the responsibility for their protection among several agents, they risk gaps in their protection . . . unnecessary and expensive duplication of coverage . . . annoying confusion and delay in the settling of claims. After describing their "full line," they suggest, "Why not take out one of our all-inclusive policies and rid yourself of piecemeal protection?"

Many salesmen examine their line periodically in order to "finger" the item which they have been most neglecting. They promote it intensively for several weeks, then move on to another dust-gatherer, while of course continuing to sell their staples.

Others make it a point always to leave pertinent sales literature with customers—catalogs, sales bulletins, even annual reports—with handwritten sales messages in the margins.

Whatever method you choose, you can be sure that as soon as you start selling *all* your products, you'll sell more.

Take stock. It's amazing how often people think they have what they haven't.

A simple offer to check a man's stock will frequently show up gaps in his inventory that neither you nor he suspected. In certain cases where permission may be necessary, be sure to get it before proceeding with your stock check. And always keep your estimates of a customer's needs realistic, for if you overload him just once, your name will be mud ever after.

Is he ordering the "economy size"? Sometimes, you can transform a so-so customer into a star account by showing him that a bigger order will actually save him money.

"Increase your order to 10 tons," suggests a fertilizer salesman to his farmer customers, "and take advantage of our special bulk discount."

"You can realize a substantial saving by signing one of our 2000-line contracts," says a local advertising representative to the customer who has already consumed 1200 lines of ad space.

"On carload orders, we pay the shipping charges," has proved a potent selling point for a supplier of yarns and threads.

If you are authorized to offer volume incentives, feature them regularly. The law of averages practically guarantees *some* nibbles.

Ask for it. A lot of business goes begging because salesmen, content with the size of the orders they are getting, simply do not ask for more. Believe it or not, some customers say, "Send me the same" from sheer force of habit. Raise the ante yourself, though, and they'll string along.

Suggest new applications for your product or service. If you can show a customer how to use more of your product or service advantageously, he is apt to buy more.

Western Union, for example, offers a "Telegram Plus" service that enables customers (who may now be using telegrams only to announce price changes) to send a telegram together with an actual sample or model of their products.

Sales Supervisor Ed Cole explains: "Under this program, we'll deliver—along with an explanatory telegram—anything that's portable and weighs less than 20 pounds: sales promotion material, a copy of a magazine opened to the page on which a pertinent advertisement appears, catalogs, brochures, cut-away models— you name it. Once we explain how it works, many of our customers use the 'Telegram Plus' service to break a campaign simultaneously all over the country. They send an explanatory telegram together with a sample or an envelope that contains a return telegraph blank. All the dealer has to do is fill out the quantity, sign the telegram and send it back."

Representatives of Thermo-Fax Sales, Inc., have upped sales of the sensitized paper used in their copying machines by suggesting many additional ways in which a Thermo-Fax can save the customer time and money.

"To cite just one instance," says branch sales manager Richard C. Rightmyer, "we've shown physicians —who originally bought a Thermo-Fax to copy medical records—that they can appreciably reduce the cost of sending out statements by setting up a ledger card system that contains the amount outstanding. The doctor's nurse can then reproduce as many as 250 such statements in one hour instead of using her valuable time to type each one out. It's been one of our most successful ideas."

An imaginative salesman for Bostitch Inc., manufacturers of staplers, immediately increased his sales when he discovered that his machine could be screwed into the driver's compartment of his customer's trucks, thereby permitting drivers to staple together important papers like bills of lading. "Just about everybody saw the benefits in keeping their drivers' papers securely together instead of risking the loss of vital and perishable records," he explains

Keep in touch. Farms expand. Families grow. Neighborhoods change. New needs arise. The objection that was 100 per cent valid six months ago may not apply at all today. Unless you're a marriage broker, check back regularly on your customers to reassess their needs.

Make surveys. Convinced that a certain industrial plant was unwittingly contributing to employee inefficiency through poor illumination, a representative of a lighting firm took an informal poll among workers, discovered that an alarming number of them suffered from early afternoon fatigue and recurrent headaches. Armed with these "testimonials"—and a report from the plant physician—he convinced his customer to revamp his entire lighting system.

In an altogether different area, it has been the experience of general insurance agent Leonard Stone of Jersey City that most people are underinsured.

"They tend to underrate their net worth," says Mr. Stone, "or overlook the fact that it costs a great deal more today to replace goods that are lost, stolen or destroyed than it did when their policies were written. When I sit down with a client who took out what was 'sufficient coverage' five years ago and

HOW TO PICK

from

Your present "share of the business" may be just a fraction of the amount to be had. In this eighth article in an FC series on successful selling, the author points up ways and means of "scooping up the treasure at your feet."

figure out his current insurance needs, he's not only amazed; he's grateful—and impressed."

The moral is clear: Prove to a customer that he *needs* more of whatever it is you are selling and he'll *buy* more.

"You're losing money." Your toughest customer has a tender spot—his wallet. Show him how buying more of your product can fatten his profits or cut his costs and you're on your way to increased business.

A salesman for an intercommunications firm hit pay dirt when he proved to customers that they could save additional time and money by expanding their basic intercom systems.

A phamaceutical representative got a druggist customer to set up an attractive display of his product instead of keeping it hidden among "regular" items by reporting the extra sales realized by a competitor who had done so. The display increased demand—and the mutual sales volume.

Aren't there ways in which more of *your* product can make (or save) money for customers?

Get referrals. There's more than one way to cash in on a satisfied customer. Among the very best is to ask him to recommend friends or relatives who might be interested in your product or service.

A salesman for a farm chemicals firm, disappointed by the scarcity of leads given even by his most enthusiastic customers, literally quadrupled his prospect list with a simple change of strategy. Instead of merely asking for names out of the blue, he suggests that customers thumb through their phone-side address books to refresh their memories. "Usually," he reports, "they surprise themselves with the number of possibilities they come up with."

An insecticide salesman discovered a little psychological trick that works wonders with his clients.

"I don't just ask for referrals," he explains. "I show them a list of 22 names that I've already collected and ask them to help me bring the list up to 25. There's something about challenging a man to complete my list that gets under his skin. At any rate, it gets me all the leads I can handle."

Remind him how much he's enjoyed what you've sold him. "Mr. Carter, I'm sure that you now realize what a cost-cutter ABC fertilizer is. Imagine multiplying the savings on that experimental acre by the number of acres you have here!" "You've already made a nice profit on your investment in this fund. Another one, begun now, could assure your son's college education." "Your hi-fi set has given you hundreds of hours of listening pleasure. With this stereo attachment, you can continue to enjoy the last word in musical fidelity." A brief recapitulation of benefits can frequently fan new desires.

Talk to his staff. Find out the latest news in *their* departments . . . problems *they* would like to see solved. Communications are sometimes poor within a large company. If you can tell a purchasing agent, "Engineering says your new Gizmo 88 is ready for production—here's the perfect package for it," he is more than likely to be impressed by your up-to-date knowledge of his needs. Possibly to the point of handing you the order.

Help him sell more. Know of a new merchandising technique that will give your customer's sales a lift? Have any ideas on how he can meet—and beat—competitive claims? Can you show him the way to new markets? Anything you can do to help *him* sell more automatically helps *you* sell more.

Many a successful salesman keys his selling to related products and current events.

At a time when the country was glutted with potatoes, for example, a salesman for Hellmann's Mayonnaise whipped up home-made signs that read, "Spud Salad Sale," and distributed them among his food-store customers. The idea sold such large quantities of mayonnaise that the home office adopted the idea, gave it a professional look, issued a free folder offering twelve mayonnaise recipes—including "Spud Salad"—and spread it far and wide.

While his timely promotion didn't solve the potato problem, that salesman's idea did boost his own and his company's volume most substantially.

You can do the same by helping your customer to polish his advertisements . . . build a mailing list . . . set up attractive displays . . . peg promotions to local or national events . . . tap new markets for his product or service—even develop new products.

Keep tabs on the competition. Are any of your customers' other suppliers falling down on the job? Turn their weaknesses to your advantage. If their service is poor, your eagerness to oblige can shine all the more by comparison. Search for ways to serve your customer better and when you find them, seize them. No need to knock your competitors when you can outdeserve them!

In short, the real secret of picking up more business from your old accounts is *creative* salesmanship, a rediscovery of the axiom, "The more you give, the more you get." ▲

HOW ABOUT YOU?

Here's a "quickie" quiz and check list to help you spot opportunities for boosting your present "share of the business."

1. Are you selling your full line?
2. Do you regularly check customer's inventories?
3. Do you feature your "economy size"?
4. Do you *ask* for more business?
5. Are you on the lookout for new uses for your product or service?
6. Do you periodically check back on—and reassess—customers' needs?
7. Can you prove that more of your product or service means additional savings?
8. Are you picking up leads from satisfied customers?
9. Can you help your customers to sell more?
10. Are you taking advantage of your competitors' weaknesses?

WONDERWALL™ cuts bag breakage for Godchaux Sugar

Another major concern, The National Sugar Refining Company's Reserve Division, producers of Godchaux brand sugar at Reserve, La., is now achieving substantial reduction in breakage with WONDERWALL bags.

WONDERWALL, developed by West Virginia, is the remarkable multiwall bag made with the new Kraftsman Clupak* paper. This paper's patented, built-in "stretch" gives it far greater toughness than ordinary kraft.

Mr. Sedgwick Howard, Division General Manager of National Sugar, states:

"Bag breakage has been cut by 51.8% in a series of shipments of more than 600 cars. The addition of an asphalt laminate sheet in our WONDERWALL bag has greatly reduced sugar hardening."

The extra toughness of WONDERWALL really pays off —and it doesn't cost you a cent more; in many cases it actually *reduces bag expense.*

See how WONDERWALLS can cut your bag breakage, and very possibly also reduce your bag cost. Just write Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Avenue, New York 17, N. Y., or 1400 Annunciation Street, New Orleans 13, La.

**Clupak Inc.'s trademark for extensible paper manufactured under its authority.*

West Virginia Pulp and Paper

Successful Farmer Meetings

By ERWIN H. KLAUS*

STUDIES OF fertilizer use made in Minnesota recently, showed, according to W. H. "Chick" Kircher, editor-in-chief of *The Farmer*, that about 50 per cent of all farmers were not even using starter fertilizer on corn and were not buying fertilizer for any other crops. "This suggests," Kircher stated, "that fertilizer manufacturers are doing a poor marketing job."

That farmers' knowledge about fertilizer is not what it should or might be was brought out by the very thorough and extensive National Plant Food Institute survey released early in 1958. For example, as reported in the survey, nearly 80 per cent of all farmers said they know the plant food elements their soil needs. 77 per cent named one or more primary plant food elements; 6 per cent named something other than primary plant food elements; and 17 per cent didn't know. *But 60 per cent gave wrong* or partially wrong answers when asked to choose grades which would correct specified plant food deficiencies.

INFORMATION PLEASE!

So we, that is all who sell fertilizer, have a problem in getting the benefits of fertilizer use understood much more clearly. Why so few have done so little in cashing in on the evident opportunities for spreading knowledge and information will have to be related to the infinite capacity of the human mind to resist the introduction of useful knowledge—in this situation, on the *giving* end. For on the *taking* end much evidence points to a wide interest among farmers for wanting information, but also for wanting it presented in a useful, logical pattern. Here is a case in point.

In its September 5 issue this year, *The Farmer* featured an illustrated front page article, headlined "What's a SOIL TEST Worth?" Farmers' interest in "useful information, logically presented" quickly manifested itself, for a check with the University of Minnesota Farm's soil testing laboratory revealed that some 4,000 soil samples were submitted for testing during September, compared to less than 2,000 samples in the same month last year.

From reading farm papers and listening to farm radio programs, one gets the impression that fertilizer is a fairly consistently advertised farm supply commodity. Pesticides, however, as Louis F. Czufin, advertising manager, California Spray Chemical Association, pointed out at the National Agricultural Chemicals meeting at French Lick, need more advertising. The figures Czufin presented are interesting.

*Ernest L. Loen & Associates, Management Consultants.

Of all 1958 farm supply advertising in *Wallace's Farmer*, a state farm paper, 8.5 per cent was for fertilizer and 5.9 per cent for pesticides. The figures for the *Progressive Farmer*, regional farm paper, were 18.6 per cent for fertilizer and 8.9 per cent for pesticides in the same year.

A study of farm supply advertising for the same period on Radio Station KFRE, Fresno, which is located in the heart of the nation's richest farm producing area and has an extensive and well directed farm program, reveals that 15.2 per cent went for fertilizer and 8 per cent for pesticides

Now, there are some limitations to telling a complete fertilizer benefit story in either the printed or the broadcast advertising message. That is not a case against advertising. Rather it is a case for supplementing the advertising through an additional medium that accomplishes two things advertising cannot do.

THE CASE FOR FARMER MEETINGS

The medium is farmer meetings. The two things that *can* be accomplished through it that advertising cannot do are:

1) You can tell a complete, localized story as the farmer is more likely to believe results and adopt practices he can interpret in terms of his own farming operations.
2) Meetings afford the farmer personal participation through which he can exchange ideas and information and learn more in the process. He can ask specific questions and get authoritative answers.

A notable third benefit of farmer meetings is the direct contact it affords the local dealer or salesman in an environment of helpfulness to customers and prospects.

Before writing this article, I asked six fertilizer companies if they were holding or had held farmer meetings as an integral part of their selling efforts. Only one came through with an affirmative answer, although it is not holding meetings regularly in all areas of its market area. The company is the Fertilizer Division of Balfour, Guthrie & Co., Limited. Not all of its meetings are farmer meetings either, since Balfour Guthrie, U. S. sales agent for Elephant Brand fertilizer, operates through distributors and encourages and helps them to put on dealer and farmer meetings.

HOW FARMER MEETINGS PAY OFF

"During the past two and a half years," George B. Simons, Elephant Brand's Minnesota-North Dakota field representative and a former county agent, told me, "I have held 64 meetings with 5,164 farmers, dealers and distributors attending. Our farmer-dealer meetings are sponsored by either a dealer or distributor or both, and some by a county agent or crop improvement association. But we provide the program in which we discuss local soil and fertilizer problems backed up with demonstrations on fertilizer usage, recommendations and results. We are always pushing soil tests as over 90 per cent of the test cases are in our favor because they show the need for more plant food. We are careful to cover the main points involved in fertilizer usage, namely high analysis, high availability, high water solubility and low cost of application per acre.

"At dealer meetings, which we hold together with our distributor in the area," Simons continued, "we discuss our complete program, including advertising and selling, results of (our) fertilizer use and college recommendations."

When asked if he could trace any direct results to what interest may have been aroused at any of these meetings, Simons didn't have to grope for any answers. "Let's take Jake Remboldt's experience in Gackle, North Dakota. He got the idea of using ammonium nitrate as a starter fertilizer for flax at a meeting we held with Dakota Maid, our dealer in the area. Last spring Remboldt applied ammonium nitrate at the rate of 40 lbs. of 33½-0-0 per acre. Despite our extremely dry weather and corresponding soil condition this summer, the flax receiving 13.4 lbs. of actual nitrogen per acre yielded 9 bushels per acre, whereas his untreated flax yielded only 5 bushels. The day Harry Becker, the dealer salesman, and I visited Remboldt, flax was quoted at $3.30 per bushel. By calculating his results we discovered how much of a *blue chip* investment he really had made. His 4 bushel increase brought him an additional gross return of $13.20 per acre, against a $1.70 per acre investment for the ammonium nitrate, leaving a handsome $11.50 added income per acre, or a 676 per cent profit on his fertilizer investment. Remboldt's attendance at that meeting paid off for us and our dealer, but it paid off a great deal better for him, and that is the way it should be."

Relating several case histories similar to that of Jake Remboldt's, Simons added, "sales of commercial fertilizer in North Dakota have increased a whooping 230 per cent since 1954, according to state reports. This increased fertilizer usage has come about as a result of the educational meetings held by county extension agents and industry, supported by continued research work done by the North Dakota Experiment Station Soils Department. Soil testing has been a big factor, for some 20,000 soil tests indicate *the lack of soil fertility on 89 per cent of all soil samples tested*. Applications of phosphate range from 15 to 40 lbs. per acre for small grains, including wheat. Recommendations for nitrogen range up to 10 lbs. per acre on fallow land and 20 to 50 lbs. on non-fallow land. Most farmers who followed these recommendations have experienced crop return increases of 200 per cent and better, thus finding a way of beating the mounting costs of farming operations."

INGREDIENTS FOR SUCCESSFUL MEETINGS

Dr. Richard B. Bahme, Western Regional Director of the NPFI, related a really compact picture of *how to* hold successful farmer meetings, based on experience gained during the several years he was with Du Pont Company's Grasselli Chemicals Department. "We held a series of educational promotional meetings

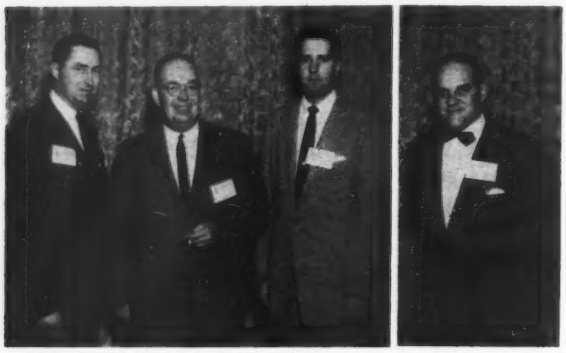
(Continued on page 51)

Man of the year for 1959, W. Harold Schelm, president, Schelm Brothers, Inc., accepts award from William B. Parrish, Awards Committee chairman. Seated: O. L. Ohnstad, retiring president.

Report on the NFSA Convention:

The 'liquid' picture for 1960

General session speaker is E. W. Sawyer, Minerals & Chem. Corp. of America. Seated: H. H. Tucker, Sohio Chem. Co.; F. M. Batson, General Chem. Div., Allied Chem. Corp.; W. S. Newsom, Jr., International Min. & Chem. Corp.; H S. Surles, Jr., Planters Cotton Oil & Fert. Co.; Muriel F. Collie, NFSA; E. C. Kapusta, U. S. Potash Co.



NFSA members elected these officers to serve in 1960: Secretary—Edward Aylward; President—Hugh S. Surles, Jr.; Vice President—Dean McHard and Treasurer—Edward A. Wex.

Vern Martin, sales consultant, Newton, Iowa, illustrated his presentation on "Eliminating Those Sales Barnacles."

IF THERE WAS one main point stressed more than any others at the 1959 convention of the National Fertilizer Solutions Association convention held in St. Louis November 8–10, it was the need for *sufficient storage space.* One of the outstanding addresses of the convention was delivered by J. E. Tuning, Spencer Chemical Company, who told the group:

"As a result of the temporary shortages last spring, and the increased demand for nitrogen solutions as well as the increased demand for other forms of nitrogen, some people have misread or misinterpreted the signs with regard to nitrogen capacity."

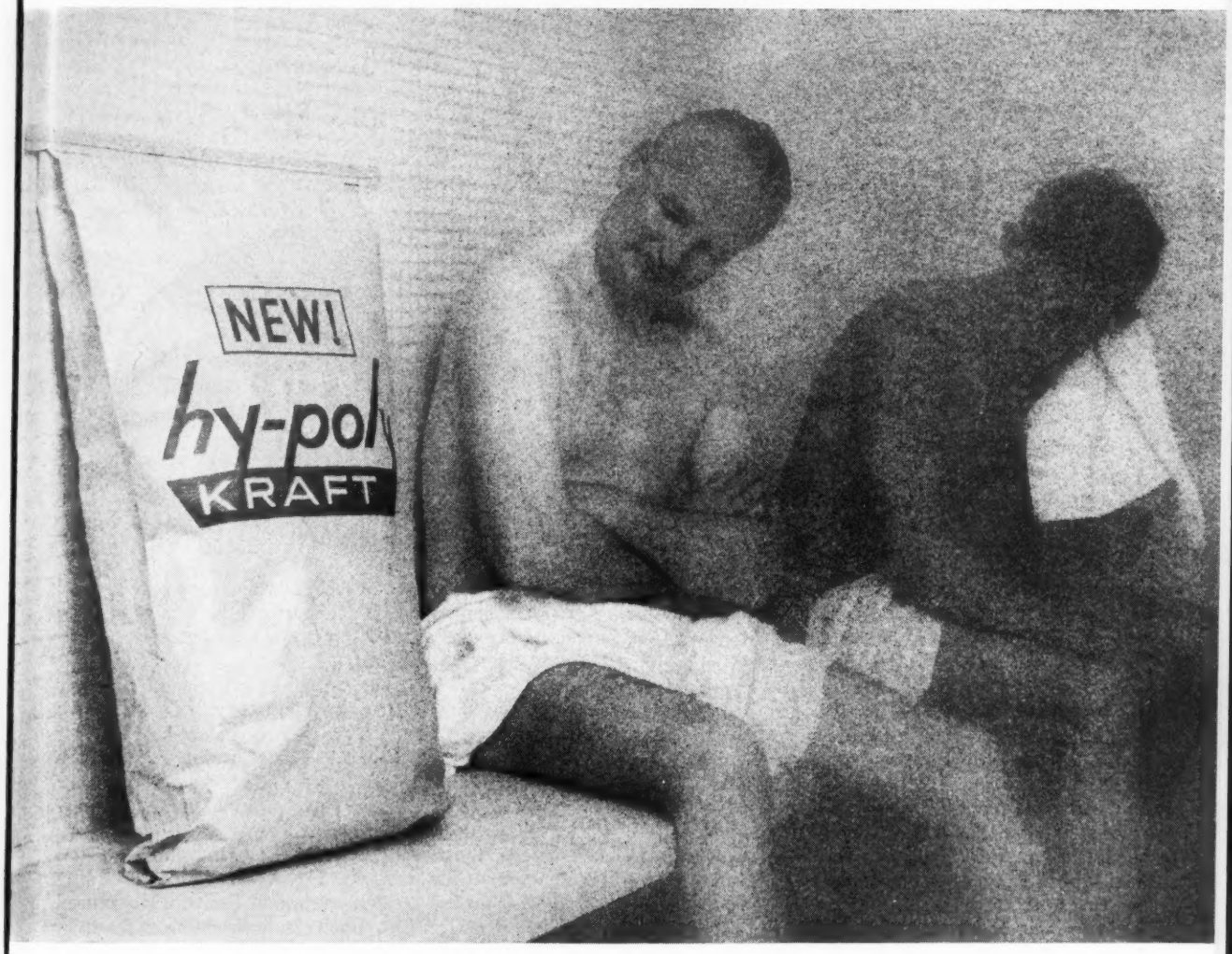
Shortages were not due to insufficient ammonia capacity, he assured the group, referring to a chart where the rated capacity for all ammonia plants was in excess of 5 million tons. Nitrogen sales for all products last year required the use of only 82% of that capacity, he explained.

He said the following was the "picture" for the present year:

1) All reports would indicate a favorable year tonnage-wise. Usage very likely will take another jump.
2) Additional storage has been or is in the process of being provided, at plant site, terminal points and usage points.
3) Additional loading facilities are being added.
4) Plant capacity for the production of solutions is sufficient. Some reappraisal of product balances may be necessary.

(Continued on page 41)

Now International Paper saves you $5 to $16 per thousand PE multiwalls!



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THE multiwall bag you see taking a Turkish bath in our picture contains *calcium chloride.*

We steamed this new Bagpak® multiwall in 95% relative humidity at 120° F. for 48 hours. (Unprotected, under these conditions, this chemical takes on 2½ times its weight in water in about an hour!)

But when we opened up the bag, the thirsty crystals spilled out as though they had been stored on the Sahara!

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Bagpak Division INTERNATIONAL PAPER New York 17, N.Y.

Fertilizer Industry ROUND TABLE

THE consumer is king. No one in your Technical Service Department will contest that old cliche for a moment. But for several days the first week in November, all eyes were turned toward Washington, D. C. where fertilizer industry specialists were treated like royalty at the annual Fertilizer Industry Round Table.

Subject: Practical Problems of Processing Fertilizers

Chairman Vincent E. Sauchelli and the Fertilizer Industry Round Table Executive Committee once again had an outstanding array of speakers ready to tackle such subjects as: 1) Plant Processes from Raw Materials to the Bag, 2) Mechanics of Formulation Calculations, 3) Models Replace Blueprints, 4) Problems of Conventional Fertilizers, 5) Semi-Granular Mixtures, 6) Statistical Quality Control, and 7) Preneutralization.

More than 450 were in attendance through the three-day meeting. They were told by Chairman Sauchelli that last year's *Proceedings* were sent to public libraries in this country and abroad. Suggestions for the 1960 Round Table were solicited and it was stressed that every effort will be made to retain the spontaneity that has been the trademark of past Round Tables.

Space does not permit summarizing all the papers given, but here is a "cross section" of the many, many outstanding presentations.

Canadian Industries, Limited has three new granulation plants under construction in Canada, L. V. Clegg told the Round Table. In explaining the organization of the largest fertilizer operation in Canada, Clegg said that the production and works managers of each of seven plants know what the others are accomplishing. They have the opportunity to study cost and performance records which are required by the various accounting departments. Daily reports contain messages that cut down on much correspondence, Clegg explained.

Much can be gained from the experiences of other plants on such matters as "summary of complaints"; truck waiting time (Trucker is clocked. Waiting time can be found on the Bill of Lading. This lets the production department know which plants are operating most efficiently); tractor and lift truck operating expenses, and handling loss.

Clegg mentioned that with granulation started this year, they have the big problem of determining what causes excessive materials losses. He mused that they have a difficult time explaining to their accounting department the additional moisture and dust losses accrued in starting a new process.

Elgin G. Doidge of Canadian Industries, Limited told the group that the three continuous granulation plants were built simultaneously—each having a capacity of 150,000 tons annually. He told of having visited companies in this country where they decided on specific equipment. He discussed the problem of dust and fume control and presented a summary of collector equipment costs. He added that automatic electric metering instruments are standard equipmen t in their plants.

Among other subjects covered, he said that safety features should be built into the plant, rather than being considered later.

"All equipment can be stopped in just 10 seconds in our plants," he added.

MECHANICS OF FORMULATIONS CALCULATIONS

W. J. Tucker, G. L. F. Soil Building Service, Ithaca, New York, started his discussion by pointing

out that formulation practices have been discussed at nearly all previous Round Table meetings and the fact that questions continue to be asked is an indication of the intense interest in the subject—particularly as it relates to granulation.

His subject was to review the calculations which are required in order to come up with a starting formula for production. He took a specific situation in which an operator is called on to formulate an 8-16-16 granular fertilizer. He explained the following three step approach to use.

STEP I—Assess the materials on hand listing their nutrient analysis and moisture content as indicated by shipper's analysis or by company lab analysis.

Decide upon the ammoniation rates which will be used.

Decide on the overages of plant food to allow.

Decide on the end product moisture content which is desired.

STEP II—Set up and solve the necessary equations which reflect the known facts, assumptions, and end product requirements stated in Step I.

STEP III—Complete, extend and check the formula against the original requirements.

H. H. Tucker of Sohio Chemical Company continued the subject of the Mechanics of Fertilizer Formulation Calculations by listing the factors which influence formulation of dry fertilizers to obtain a desired product. They are:

1) Grade of fertilizer.
2) Type of fertilizer to be manufactured (granular, semi-granular, or pulverant).
3) Desired rate of production.
4) Raw materials available.
5) Costs of raw materials.
6) Variation in qualities of raw materials.
7) Equipment of production.
8) Plant location.
9) Length of storage of product.
10) Use as bagged or bulk fertilizer.
11) Atmospheric or weather conditions.

Tucker said his aim was to deal only with raw materials—insofar as possible—only nitrogen raw materials, he added. He said that as many as three raw materials may supply the plant food nitrogen.

"In addition," he continued, "the amounts of free ammonia nitrogen and nitrogen from salts must be considered. The amount of so-called soluble salts (ammonium nitrate and urea) is very important. Still further, the relationship or proportion of urea to anmonium nitrate is extremely important."

He listed a few rules of thumb which can be used as a guide. Some of them are:

1) Ammoniate to the highest possible rate consistent with phosphates used, phosphate reversion, nitrogen losses, and manufacturing facilities.
2) Adjust total soluble salts to manufacturing and drying facilities, storage conditions, and use of product.
3) Limit amount of urea when used in conjunction with ammonium nitrate.

Referring to the phosphate ammoniation rates which were discussed in detail at last year's Round Table, Tucker listed the following ammoniation rates per unit of phosphate to be used as rates from which to "tee off":

4.0# for triple super.
6.0# for normal super.
7.2# for phosphoric acid.
7.6# for phosphoric acid and normal super.

Tucker said that last one mentioned gives a possible .4# bonus factor over phosphoric acid alone when phosphoric acid and normal super are used together.

Before getting into a lengthy description of his well

The panel on Preneutralization, seated at the reserved table, from left to right, is composed of F. G. Kennan, DuPont; G. Marburger, Spencer Chemical; N. K. Alfrey, W. R. Grace; G. R. Gilliam, Allied Chemical; Vincent Sauchelli, NPFI and P.E. Stone, Virginia-Carolina.

Chairman Vincent E. Sauchelli addressed the annual Fertilizer Industry Roundtable and asked for suggestions concerning the 1960 Round Table.

known triangular diagrams, Tucker said that "the upper amount of soluble salts which may be used will depend largely upon the kind and grade of fertilizer, and upon the ability to dry the end product. Adjustments of nitrogen materials as well as in the amount of acid used will affect agglomeration, stability of the product, and amount of drying required."

He added that a general rule of thumb on the amount of urea which can be used in conjunction with ammonium nitrate is not over 50 per cent of urea per ton of end product. He said that the range between 20 to 40 pounds is perhaps preferred.

Tucker suggested that if those attending the Round Table were not already using triangular diagrams that they do so in helping both in original formulations and calculations—and in adjusting formulations. Then he discussed some of the things that can be portrayed on such triangular diagrams. This portion of the program was undoubtedly one of the main features and was thoroughly appreciated by representatives of the industry.

PROBLEMS OF CONVENTIONAL FERTILIZERS

J. O. Hardesty of the USDA discussed solutions containing both urea and ammonium nitrate and the mutual solubility of the two products. He further analyzed how the solubility of these two salts will effect the solution phase of fertilizer mixtures. As a guide he presented the following mixed fertilizer formula:

Mixed Fertilizer Formula (10-10-10)

Material (50-60 mesh)	lbs/ton	
Ordinary superphosphate	806	
Triple superphosphate	81	
Ammonium sulfate	520	
Ammonium nitrate (solid)	125	210# NH_4NO_3
Ammoniating solution (22-65-0)	130	
Potassium chloride	338	
Total (10-10-10)	2000 lbs.	
Moisture content of mixture	4.3%	
Crushing strength of dry cake	240 P.S.I.	

Hardesty said that rapid and satisfactory curing depends on:

I) A relatively high moisture content, which promotes

(a) rapid rate of chemical reaction with a corresponding rapid increase to the maximum temperature of the pile,

(b) increase in plasticity of the mixture to insure tighter packing,

(c) a high amount of soluble salts in solution to give a high degree of crystal knitting and primary set when the pile temperature drops

II) Finely-divided ingredients, which promotes

(a) thorough mixing, and

(b) close packing in the pile, to give

(1) uniform chemical reaction, and

(2) firm primary set

III) High mechanical pressure (large pile), promotes

(a) close packing, to give

(1) uniform chemical reaction, and

(2) firm primary set

Conversely, satisfactory physical condition in the package depends on:

I) A relatively low moisture content, accompanied by

(a) little or no chemical reaction,

(b) no moisture absorption during, or subsequent to the bagging operation

(c) a low amount of soluble material in solution, and therefore

(1) less soluble material thrown out of solution by any given range of temperature drop, which produces

(2) less chance of crystal knitting

II) Large particle size, or aggregates, of ingredients which provides

(a) a minimum number of points of contact between particles, and therefore,

(1) less packing, and

(2) less crystal knitting

(b) minimum surface area, to give

(1) efficient coverage with a finely divided conditioner, and

(2) less moisture absorption

III) Low mechanical pressure (low bag-storage pile) produces

(a) minimum amount of packing, to give

(1) fewer points of contact between particles, and

(2) less crystal knitting

Once again H. H. Tucker "took the stand" and explained some of the reasons for the acceptance of four component ammonia-nitrate-urea water solutions the past few years. He listed them as follows:

1) Lowers saturation temperature, salt out temperature and the vapor pressure of the solution.

2) Makes possible the transportation, storage and use of higher fixed to free ration nitrogen solutions—solutions with a higher ratio of salts to ammonia.

3) Increases the amount of nitrogen which can be obtained from solutions.

4) Reduces the amount of acid required to neutralize excess free ammonia and consequently prevents excessive heat.

5) Increases the volume of the solution phase and therefore the agglomeration of fertilizers.

6) Alters the crystal structure of ammonium chloride.

7) Softens the end product or decreases the hardness of bin or bag set

Ammonium chloride may form as either a branched fern shaped crystal or as a cube crystal, Tucker con-

tinued. The use of urea in fertilizers containing ammonium chloride favors the formation of cube type crystals. Ammonium chloride, though not added as a material, results from the reaction of ammonium nitrate and potassium chloride.

Tucker said that research has indicated that at least 20 pounds of urea per ton of end product is required to thoroughly permeate the mixture and bring out this change in crystal structure.

What is the upper limit on the amount of urea which can be used with ammonium nitrate? Tucker said this will depend on such factors as grade of fertilizer, moisture content, type and length of storage and atmospheric conditions—particularly temperature and humidity.

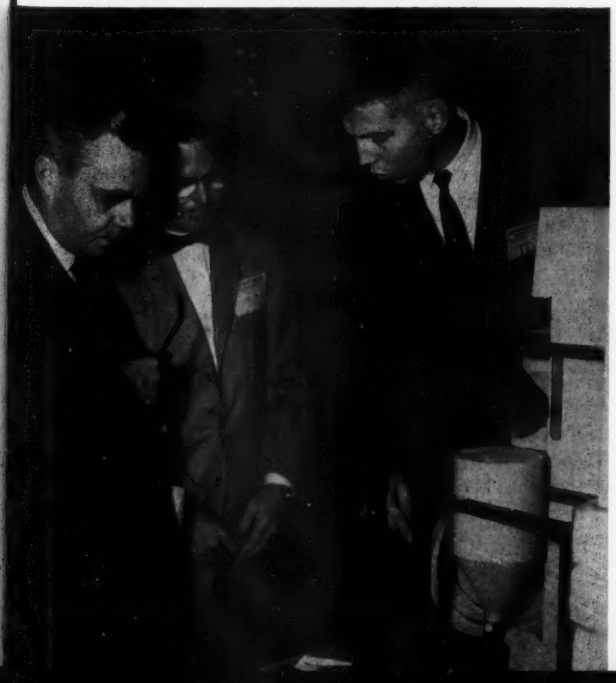
Tucker added that a general rule of thumb is that 50 pounds of urea per ton of end product is the upper limit when used in conjunction with ammonium nitrate.

"The amount of solution to be used should then supply between 20 to 50 pounds of urea," he continued. "An even narrower range of 30 to 40 pounds may be preferable."

Another question which Tucker attempted to answer was: Will a small amount of ammonium nitrate increase the fixed-to-free ratio and lower the salt out temperature of urea ammonia solutions?" Realizing that many companies asking this question want to be competitive cost-wise and to use large amounts of solution and low amounts of acid, he answered that high fixed-to-free ratio solutions of this type can be made but not with the low water content and high nitrogen content which they would also like to have in their ideal "nitrogen solution."

He added that this is due to the fact that urea is not as soluble in aqua ammonia (ammonia and water) as is ammonium nitrate. In other words, the ammonium nitrate ammonia solutions already have a "head start" over the urea ammonia solutions as far as salt concentration is concerned. He said that to expect a small amount of ammonium nitrate to overcome this solubility handicap, and more too, is a rather large order.

Looking at a "mock-up" presented at the Fertilizer Eng. & Equip. Co. booth are, from left to right, Curtis Cox, Virginia-Carolina; R. Church and N. Jones of Du Pont.



SEGREGATION OF FERTILIZERS

W. L. Hill of the USDA began the "segregation" discussion by saying "Segregation is the opposite of interspersion. In descriptive use the term implies an unmixing of something once mixed."

He said that "one kind of segregation occurs during pouring operations. Sorting of particles of different sizes and densities in mutually hindering fall through eddying air takes place in conformance with known rules. A different set of rules applies when the granules strike a conical pile. Plant operators know how to minimize this type of segregation. Another kind of segregation occurs as a consequence of vibration. Settling in the pile or bag is an instance of mild vibration or jostling."

He continued: "The structure of a fertilizer in a pile or bag refers to the mutual disposition of the granules in the assemblage. It is described in terms of spacing and packing factors."

Hill went on to explain porosity of fertilizers in bulk, saying that it is determined by the level of fineness, granule size distribution, granule shape and surface character, thoroughness of interspersion of sizes and shapes and granule packing.

In explaining mixture of granule sizes he said that "since the size of the channelways is determined by granule size, shape and packing, meaningful discussion must be directed to particular kinds of granule assemblages under specific conditions. A frequently encountered assemblage is one composed mainly (60 per cent or more by weight) of granules in a fairly narrow size range with lesser amounts of smaller granules. In this case, the structure is determined by the dominant size class, and, if the limits of the latter range be known, the critical diameter of the channelway can be found with the use of the tentative factor noted above. Assemblages with no dominant size class are less tractable and perhaps can be generally avoided in fertilizer practice."

Discussing processing problems in batch mixing of fertilizers was Robert E. Robinson of the Atlanta Utility Works, East Point, Georgia. Here is a summary of his talk:

The underlying theory of mixing dry solids is based on certain natural properties of these solids. There are many ways of accomplishing mixing, and choice of method and equipment is dependent on these properties and other requirements. In the fertilizer industry the rotary drum batch mixer emerged as the primary equipment for dry mixing of solid fertilizers.

With the advent of synthetic nitrogen solutions, mixing of fertilizers became a chemical operation involving chemical reactions in addition to physical processing. Early ammoniation was accomplished in existing type equipment with minor additions and techniques were relatively simple and trouble free. Proper utilization of a batch mixer for ammoniation requires an understanding of the mass flow of material in the mixer past the solution distributor and

consideration of the time factor in introducing solutions into that mass. Distributors have been developed which match the concentration of solution flow to the mass flow to give uniform ammoniation in the minium time.

Requirements for mixing, ammoniation, and granulation impose added problems on the batch mixer, regardless of whether granulation is accomplished in the mixer or in a rotary drum following the mixer. Controls must be used to maintain physical conditions suitable for accomplishment of the granulation process as well as for accomplishment of mixing and ammoniation reactions, and in addition conditions must be maintained within the operating capabilities of the batch mixer.

Batch mixers have always had many features affording good service to the fertilizer manufacturer. Recent developments in mixer construction have made possible operations once thought impossible for batch mixers, and mixer design has progressed with changes in fertilizer manufacturing practice.

Operating procedures must cover a very wide range of conditions and problems, including different grades being manufactured, different types of fertilizer such as powdered, semi-granular, or sized granular, production rates required, methods of control available, and many others. Obviously, we cannot set down a few rules that will cover all situations.

Installation and maintenance of rotary drum batch mixers has become increasingly more exacting as the mixers have become more complex and operating conditions more severe.

SEMI-GRANULAR MIXERS

T. R. Schmalz of F. S. Royster Guano Co., Norfolk, Va. explained their experiences where semi-granulation is the object. He said that the grades involved in their operations run from 4-10-7 and 4-12-12 to 10-10-10 and include such grades as 5-10-10 and 8-16-16.

He said that fairly close particle size production must be maintained, since no recycle is used in this method of operation. The grade to be manufactured has a great deal to do with the characteristics of operation, he continued, but some basic considerations apply pretty well without considering the specific analysis.

He said it is safe to say that best results occur when coarse potash is used than fine. The product appearance improves with increasing potash requirement.

"In the same respect superphosphate does a much better job of covering and binding the particles of potash than does Triple. Sulfuric acid plays a leading role in this operation and is used to react with Ammonia from Solutions and to elevate temperature in the mixer to promote plasticity and drying."

He said that varying amounts of Acid are used, ranging from 80# of 66° Be Acid per ton, all of which is in excess of that required for Ammonia absorption at reasonable ammoniation rates to 130# of 66° Be Acid, all of which is needed for Ammonia reaction.

"It appears that for grades with Nitrogen requirements of 4% to 6% the Urea containing Solution with its greater solubility is best," Schmalz said; "For higher Nitrogen requirements the Ammonium Nitrate Solution is probably better."

Concerning mixer arrangements, Schmalz said a good exhaust hood and stack of a normal type mixer is desired since considerable volume of vapor is generated by the high temperature in the mixer. He said that distributor pipes should be as long as possible with good distribution patterns for optimum results.

Concerning cooling of the product, he said that they have not experienced Phosphate reversion—even with pile temperatures which would cause reversion in conventionally made goods. He said that this is probably because of the lower moisture content of the goods.

He suggested the use of a rotary cooler with an air handling system.

STATISTICAL QUALITY CONTROL

"We must accept the fact that variability is with us," C. H. McCall of Booz-Allen Research told the group in beginning his discussion of statistical quality control (SQZ).

"The buyer is interested in what is in the bag," he went on.

He warned that their averages are "dangerous statistical beasts" and there are risks associated with the generalizations of results obtained through SQZ. However, he added, he who uses properly the tools that are available will no longer be at the back of the pack but will become a part of the great technological advances that are becoming so important to the fertilizer industry as a whole.

Vance Ward of Canadian Industries, Ltd. continued this subject on the final day, showing how SQZ is actually being applied to fertilizer problems. He demonstrated a valve packer machine, indicating the variations which SQZ picks up in actual bag filling.

He showed how the inherent error of the machine is exposed by SQZ and brought out how to "hunt" for the right setting. He said the problem of guaranteed analysis is becoming more acute, making SQZ a "must."

PRENEUTRALIZATION TOPIC POPULAR

"The use of a preneutralizer to manufacture granulated mixed fertilizers is a recent development in the fertilizer industry that has followed granulation itself by only a few years," G. C. Marburger of Spencer Chemical Company, told the Round Table.

A summary of his comments follows:

The potential use of preneutralization in a mixed fertilizer plant is for the production of high nitrogen grades. To evaluate whether or not it can be applied to a specific plant depends on the two primary reasons for its utilization. The first is economics, that depends on achieving cost savings in grades presently being produced.. The second is the potential for producing "exotic" grades such as 20-10-5, 16-8-8, 15-15-10, and 14-0-14. If a potential market exists for these grades, the process becomes worthy of consideration.

In addition there are three secondary benefits. As their value becomes better known, these secondary

(Continued on page 35)

READER SERVICE

FREE INFORMATION to help you solve fertilizer, pesticide problems

Chemicals

353—PYRENONE AEROSOLS

Informative data on industrial-type Pyrenone metered aerosol insecticides is presented in the latest technical bulletin prepared by Fairfield Chemicals, Food Machinery and Chemical Corp. The bulletin is available free as a guide to insecticide manufacturers, aerosol fillers and packagers. The nine page bulletin includes performance data on concentrated Pyrenone as well as formulations and suggested labels for metered aerosol insecticides. Also included is a source list of aerosol components and a section on the use of concentrated Pyrenone with automatic dispensers. Copies are available by

CIRCLING 353 ON SERVICE CARD

354—EMULSIFIER PAIR

A new emulsifier pair from Stepan Chemical promises to simplify inventories and formulations for formulators of toxicant systems, Stepan reports. Called Toximul R and Toximul S, the pair will emulsify such pesticides as weed killers and chlorinated and phosphate insecticides. Another development, Toximul LF is used for soil insecticides and other toxicants in most liquid fertilizers. Complete information may be obtained on all three products by

CIRCLING 354 ON SERVICE CARD

355—EASTMAN CHEMICAL PRODUCT INDEX

The complete list of industrial and specialty chemicals offered by Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., is now available in a newly published product index.

The industrial chemicals listing features data on physical properties as well as shipping information and is classified into seven sections: Acids and anhydrides, alcohols, plasticizers, aldehydes, aromatic intermediates, solvents and miscellaneous chemicals. Among the specialty products described are Tecmangam, a soluble source of manganese for fertilizers. For your copy

CIRCLE 355 ON SERVICE CARD

356—FORMULATION DATA

Specifications and processing information are included in a pesticide technical bulletin from Floridin Co. The company produces grades of fuller's earth ranging from finely ground to standard meshes, will see that a copy of their bulletin is sent to you, if you

CIRCLE 356 ON SERVICE CARD

357—CHLOROPHEN

"Chlorophen 663 and 664" is the title of a new technical bulletin from Reichhold Chemicals, Inc. The bulletin describes the use of Chlorophen in pre-emergence weed control and for soil poisoning. Specifications, physical properties and solubility data are included, as well as information on the use of 663 and 664 for slime and algae control and other uses. The company will send you a free copy, if you

CIRCLE 357 ON SERVICE CARD

358—INSECTICIDE BAITS

Tests with fruit flies and other insects have proven that P.I.B. (protein insecticide baits) give sprays better and surer kill efficiency at lower cost, according to A. E. Staley Mfg. Co. The maker says that attractant properties hold for two to three weeks. Full details are available, by

CIRCLING 358 ON SERVICE CARD

359—TESTING SERVICES

A free schedule of services is available from Scientific Associates. Listed are prices for chemical, biological, and physical tests, and toxicity tests, as well as a description of special services offered by the firm. They include advertising assistance, certification of products, consultation, and many others. The fourteen-page booklet will be yours, if you

CIRCLE 359 ON SERVICE CARD

360—NON-TOXIC INSECTICIDE CONCENTRATES

"Non-Toxic and Low Residue Agricultural Insecticide Concentrates" is the title of a 17-page book from McLaughlin Gormley King Co. It includes two sections; one is on "information for manufacturers of Pyrocide dust" and the other on "information for manufacturers of P-M dust." Among the topics covered are storage and handling, diluents or carriers, other insecticides or fungicides compatible with Pyrocide or P-M dust, mixing and sifting, packing and storage, labeling, registration, strengths and dosages, and points to be emphasized in selling. To secure a copy

CIRCLE 360 ON SERVICE CARD

Process Equipment

361—PAN GRANULATING PROCESS

Both high and low analysis fertilizers—including those containing minor ingredients and pesticides—are being produced with the Duetag pan granulating process, according to Dungemittel-Technik Ag./-Basel, Switzerland. Davidson-Kennedy Co. and Fertili er Engineering and Equipment Co. have been appointed exclusive agents for the process in this country. Granules are reported to be spherical in shape, uniform in size and of high quality with exceptional storage qualities. Complete information and a brochure are available. Simply

CIRCLE 361 ON SERVICE CARD

362—NIAGARA METERS

A new catalog of Niagara Industrial Liquid Meters includes additional data to facilitate use of the meters in measurement of 200 liquids. Among those listed are DDT, toxaphene, weed killers, anhydrous and aqueous ammonia, ammonium nitrate, ammonium sulfate, ammonium phosphate, nitrogen solutions, phosphoric and sulfuric acids. The catalog includes dimensions, pressure loss data and principles of operation. To get your copy

CIRCLE 362 ON SERVICE CARD

363—CHEMICO BROCHURE

Descriptions of ammonia, hydrogen, methanol, nitric acid, sulfuric acid and urea processes and flow charts are included in a 16-page, two color brochure from Chemical Construction Corporation. Also included is a brief history of Chemico and information on its engineering and construction organizations. Another section is devoted to gas scrubbers, both Venturi and Cyclonic types. You will receive a free copy, if you

CIRCLE 363 ON SERVICE CARD

364—FLOW METERS FOR PROCESS AUTOMATION

New electronic controls, registers and readout equipment provides liquid metering automation at operating pressures limited only by the process system, according to Bowser, Inc. Flow meter capacities range from 0.1 gpm to more than 40,000 gpm; and temperatures range from −445°F to −1500°F. The system utilizes a pipe-mounted, straight-through device known as the Pottermeter which contains an electric current-generating, turbine-drive rotor. Electrical output is directly proportional to the rate of flow, and ac-

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- *Circle number of literature you want*
- *Print or type your name, position, company and address*
- *Clip and mail the Service Card*

See page 52 for information on these Reader Service numbers:

378—New Dryer from Finco, Inc.

379—Crown Thermo-Tape Machine

curacy is sustained at any velocity, according to the manufacturer. To obtain detailed information

CIRCLE 364 ON SERVICE CARD

365—GRANULAR FERTILIZER PROCESSING EQUIPMENT

A 12-page, two-color bulletin, "Renneburg Continuous Granular Fertilizer Processing Equipment" has been published by Edw. Renneburg & Sons Co., and is available to readers. It pictures and describes the continuous combination ammoniator-granulator, dryer furnaces, dryers, coolers, air handling systems and pilot plant equipment. To obtain a copy

CIRCLE 365 ON SERVICE CARD

366—HEAVY-DUTY CONVEYOR BELT FOR 45° IDLERS

According to Manhattan Rubber Div. of Raybestos-Manhattan, Inc., it is now possible to successfully use and obtain benefits of 45° troughing idlers for carrying all materials with its Ray-Man conveyor belt. Ray-Man construction is reported to be doubly compensated so that outer ply stretches as inner ply contracts under both lateral and longitudinal flexing, and even on reverse bends. R/M says it will offer a guarantee against ply or cover separation at the idler hinge line —good for the life of the belt—when it is used with troughing idlers set at any angle up to 45°. Principal advantage claimed for use of the 45° idler design is greater payload. For details,

CIRCLE 366 ON SERVICE CARD

Materials Handling

367—BUCKET ELEVATOR

A portable bucket elevator, said to be ideal for handling granular materials up to a 12′ height, has been announced by New London Engineering Co. The manufacturer says it has powerful electric motor drive, steel buckets bolted to belt, delivery chute, hopper and casters to suit each application. Details will be yours, by

CIRCLING 367 ON SERVICE CARD

368—"HOW BOOK"

Free on request is Yale & Towne Manufacturing Co.'s "How Book" which describes 1) a detailed method of cutting materials handling costs, and 2) additional ways to increase production. Diagrams and illustrations augment the book's instructions concerning the use of the Vis-O-Graph chart. This chart enables you to analyze step-by-step the routine of your materials handling operation. A Vis-O-Graph Summary completes the analysis, giving you a practical and exacting means for the collection of totals from the Vis-O-Graph chart, Y&T reports. For your copy, just

CIRCLE 368 ON SERVICE CARD

Application Equipment

369—KAW APPLICATOR

Designed for mounting on most late model tractors, the K-55 applicator will place starter solutions two inches to the side and below the seed, according to Kaw Fertilizer Service, Inc. Rate of application is regulated by replaceable plastic orifices. A brochure from the company illustrates the planter attachment and offers further information. To secure your copy

CIRCLE 369 ON SERVICE CARD

370—LIQUID FERTILIZER APPLICATORS

Pollard mixed liquid fertilizer applicators and liquid nitrogen applicators are illustrated and described in literature from Pollard Manufacturing Co. The manufacturer says its applicators are efficient, rugged and economical. Tank on the mixed liquid fertilizer applicator has 1¼ ton capacity. Other features of the applicator include high clearance frame, adjustable boom height, short turning radius and constantly visible flow, according to Pollard. For copies of the literature,

CIRCLE 370 ON SERVICE CARD

371—NEW TYPE OF TEEJET NOZZLE

A new type of TeeJet Spray Nozzle has been introduced by Spraying Systems Co. permitting the fabricating of a spray boom from an angle-iron instead of piping. Nozzles are mounted in holes drilled in an angle-iron at desired intervals and the hose shanks are connected by hose to make up the complete boom. The complete nozzle consists of hose shank, nozzle body, cap and strainer body made of nylon, with strainer screen in stainless steel and orifice tips in either aluminum or stainless steel. Complete information on the nozzles is contained in a data sheet. Just

CIRCLE 371 ON SERVICE CARD

Miscellaneous

372—EPOXY REPAIR KIT

Carboline Co. has released a new epoxy multi-use repair kit for making "on the spot" repairs in plant, mill and factory. The kit is a two-component, fast setting, epoxy material that cures to a hard, tough, tightly bonded patch. Using Carbo Fix, repairs can be made to equipment, pipes, tanks, valves, fixtures, machinery and other plant items, Carboline says. Two types are available: Carbo Fix S is a general repair material with good chemical resistance for repairs to most surfaces, including glass. Carbo Fix C is reported to have excellent chemical resistance and is recommended by the manufacturer where chemical attack is of major consideration. Additional information will be yours, if you

CIRCLE 372 ON SERVICE CARD

373—FEND CREAMS

Three new creams that provide protection against skin irritants encountered in industry have been developed by Mine Safety Appliances Co. MSA recommends Fend A-2 against water insoluble irritants; Fend I-2 against water soluble irritants such as ammonium nitrate solutions, nitric, phosphoric and sulfuric acids; and fend S-2 against soluble and insoluble irritants, including fungicides and urea formaldehyde. A bulletin contains more information on the creams. It's yours, by

CIRCLING 373 ON SERVICE CARD

374—MOISTURE INHIBITOR

Harmful effects of moisture in electrical equipment are reportedly being eliminated by application of CRC Moisture Inhibitor. Corrosion Reaction Consultants, Inc., says the product eliminates the effect of wicking, reduces electrical failures and costly downtime. One application, by total immersion, by pouring, brushing or spraying, under most conditions will provide protection for at least a year, the firm claims. For complete technical data,

CIRCLE 374 ON SERVICE CARD

375—"PROTECT YOURSELF"

That's the title of a new brochure available without charge from Willson Products Division. It covers personal safety equipment—respirators, goggles and gas masks. A free copy will be mailed to you, if you

CIRCLE 375 ON SERVICE CARD

376—DUST AND FUME FILTRATION

A descriptive four-page folder, "The Modern Solution to Fume and Dust Filtration Problems," is available free of charge from Menardi & Co. Among applications for the company's Maco-Glas fabric filter bags covered in the folder are in the fertilizer industry. It states that the bags have been successful in collecting dust from triple superphosphate production. The folder will be mailed to you, if you

CIRCLE 376 ON SERVICE CARD

377—SERVICES & PRODUCTS CATALOG

"General American Services & Products for the Process Industries" is the title of a 20-page catalog from General American Transportation Corp. It describes and pictures GATX tank cars, Airslide cars, Dry-Flo Cars, custom fabrication, field erection, tank storage terminals, mixing devices and Louisville dryers. The section on dryers contains a selector table which lists a variety of materials, including DDT, diammonium phosphate, fertilizers, phosphates, potash, and 2,4-D powder. For your copy just

CIRCLE 377 ON SERVICE CARD

(*Continued from page 32*)

benefits may prove to be primary reasons for its utilization:

1) Less recycle is required, therefore higher production rates and/or the use of more solution as a source of nitrogen.
2) Less fumes created.
3) Less nitrogen loss.

Commercial production experience to date indicates that the process is simple in operation. The proper sizing of the preneutralizer tank is important for achieving high production rates.

Arthur O. Hansen of The American Agricultural Chemical Company, described the pilot plant production of mixed fertilizers from preneutralizer fluids.

He explained that the process described (with full use of slides) the preneutralization of nitrogen solution with 60° Be sulfuric acid, 75% phosphoric acid and mixtures of both acids and the blending of the resulting fluid with dry solids to form high analysis mixed fertilizer. Objectives of this work were as follows:

1) To enable use of more liquids in formulas with little or no solids recycle. This would then result in lower formula costs and higher production rates.
2) A better process for high analysis and X-O-Y type or nitrogen potash grades.
3) Low cost water soluble fertilizer.

CONCLUSIONS

Advantages

1) The key advantage of preneutralization is that the heat of reaction between the ammonia solutions and acids may be fully utilized to drive off excess water from these liquids. It is ideally suited for 60° Be strength acid and for nitrogen solutions low in NH_3 content.

2) A larger amount of liquid may be incorporated in a formula, making it ideal for grades exceeding 12% N and X-O-Y types grades.

Thirteen units from nitrogen solution of low ammonia content (22%) may be added to these grades without requiring recycle for granulation control. For phosphate containing grades, part of this (5-6 units) is used to preammoniate the base. The remainder is added as preneutralizer fluid.

3) Since the acid is preneutralized, side reactions with muriate, dolomite and other solids are eliminated. All of the acid is thereby utilized, and also, fume problems are reduced.

Disadvantages

1) To obtain maximum benefits and formula flexibility, preammoniation of the superphosphate is required. This is not a serious drawback, since 4-5 units nitrogen solution may readily be batch mixed with the base.

2) Anhydrous ammonia cannot advantageously be used in the preneutralizer tank. Therefore the process is not suited for such grades as 4-16-16 and 5-20-20. This is not a disadvantage, however, if the preneutralizer is regarded as a supplementary piece of process equipment. It is entirely probable that the preneutralizer may be used in conjunction with the TVA ammoniator—particularly if the TVA reciprocating pipe is used to distribute the fluid on the rolling bed.

3) There is a problem of startup and shutdown of the reactor. To avoid ½-¾ startup time, the reactor may be shut down on the previous days operation by adding some water to it, and keeping the contents hot with a small steam coil or electric heater. However, drainage of the reactor is necessary if a different acid is to be used.

4) Contact H_2SO_4 66° Be cannot be advantageously used in the reactor. This is because it is necessary to replace all the water driven off by the reaction. Otherwise the fluid becomes so hot and dry that the ammonium nitrate will destroy itself and go up in smoke. If we replace all of the water we are driving off—we are then nullifying the basic purpose of the reactor.

5) In order to obtain the desired physical features of the process (i.e. prevention of puddling and overgranulation) it is necessary to sacrifice up to 5% of the total nitrogen input.

James W. Lewis, E. I. du Pont De Nemours and Company, explained the use of Uramon X Ammonia Liquors in conventional fertilizers.

He said that "Uramon" ammonia liquors, also called UAL solutions, are available in several different compositions designed to meet a wide range of requirements in the fertilizer industry.

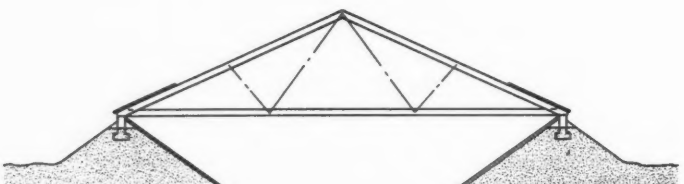
Lewis said that the starting point in formulating conventional complete fertilizer mixtures is the selection of the amount of free ammonia to be used per unit P_2O_5. He said this depends on 1) the grade, 2) past experience with the particular superphosphates, 3) use of a cooler, 4) expected storage time, and 5) what other formula ingredients are involved, especially those of a strongly alkaline nature (cyanamind, active limestone).

He added that the rates of ammoniation recommended are three pounds free ammonia per unit P_2O_5 from triple and five pounds ammonia per unit for ordinary super. Lewis said that as the rate of ammoniation is increased beyond four pound NH_3/unit P_2O_5, consideration must be given phosphate reversion, absorption capacity of the particular superphosphate, mechanical equipment, grade of mixture and other factors. He added that rates beyond six pounds/unit for ordinary super should be considered as specific plant developments. Each manufacturer should determine the feasibility of such operations and should plan on using a cooler following ammoniation.

A continuous prereactor was discussed by N. K. Alfrey, W. R. Grace & Company & Co., consisting of a compact concentric pipe arrangement, all of the liquid raw materials required for granulated mixed fertilizers are premixed and prereacted before introduction into the solid raw materials. (See June issue, FARM CHEMICALS, page 41.)

Alfrey pointed out that the prereactor has been successfully operated in full scale production plants. Elimination of ammonium chloride fume and loss of free ammonia from the ammoniation step, flexibility of operation, and absence of toxic gas evolution were listed by Alfrey as the advantages of this prereactor. ▲

WET PROCESS PHOSPHORIC ACID IN LIQUID FERTILIZERS



Pool-type storage unit is explained on the next page.

By F. M. BATSON*

THE FERTILIZER industry manufactures a great deal of phosphoric acid by the wet process, and uses it to make triple superphosphate. This acid, which contains organic matter, and other materials extracted from the phosphate rock, may be dark green, or almost black, in color, which has led to it being called Green Acid. Such acid is quite suitable for the purpose for which it was intended, making triple superphosphate. For most other purposes, however, wet-process acid must be purified.

One of the problems of liquid fertilizer manufacturers has been to find adequate, economical, and timely supplies of raw materials. As short a time ago as 1956, one of the trade journals, in reporting on the need for cheaper raw materials, stated,

"Wet-process phosphoric acid cannot be used for making neutral solutions because it causes precipitation. Since it is both cheaper and more plentiful than the electric-furnace product used today, development of ways to use it would give the liquid mixes an important economic boost."

It is easy to understand that wet-process acid that was entirely satisfactory for triple super production might not be satisfactory for liquid use in its "as is" form. When the acid manufacturers became aware of the extent of your tonnage requirements for acid, and of the quality needs, General Chemical, and probably the other wet-process acid producers too, went to work to try to meet those demands. We now find in recent trade journals of the successful use of wet-process acid for making liquid fertilizers.

There are manufacturers who produce purified wet-process acids for uses other than superphosphate. If I may be permitted, I will talk about General Chemical's product, since that is the one with which I am most familiar. I am reasonably certain, however, that the statements I may make will apply equally as well to other purified wet-process acids.

General Chemical does not manufacture triple superphosphate and has no interest in it. We do, however, produce our own wet-process acid for use in the manufacture of sodium phosphates of various types. The acid is made by a process which eliminates the organic and certain other impurities to permit its use in our exacting chemical processes. By concentration, this same acid is made available to you liquid fertilizer people as Green Acid, of 75% strength. Several years of experience by liquid fertilizer producers on the East Coast, and a somewhat shorter, but equally significant, period of experience on the part of Midwest producers, has shown that this Green Acid can be used successfully. By observing normal mixing techniques, and by making only slight changes in the ordinary handling procedures of the neutralized mixes, Green Acid is now used successfully in all liquid fertilizer formulations.

The article quoted earlier referred to a precipitation which results when Green Acid is neutralized with ammonia in the production of liquid fertilizers. Actually, the milky substance which forms does not introduce any serious handling problem. The milky appearance is due to the presence of very light particles, microscopic in size, consisting mainly of iron and aluminum phosphates. The fertilizer is put on the fields in the normal fashion, using the regular spray nozzles. The orifices are not clogged by solutions made from purified wet-process acid. On standing the cloudy material will gradually settle, but is easily resuspended by air agitation, or by recirculation. A case in point, illustrating this, one Eastern producer held a completed fertilizer solution in his storage tank over the winter. He applied it to the fields the next spring, after a brief recirculation through his pump. He had no trouble.

As for the milky color itself, there are those who feel that the appearance of such solutions has a decided sales advantage. I recall in the early days of liquid fertilizers, on the East Coast, one manufacturer said to me "I couldn't sell milky white fertilizer

* Batson, of General Chemical Division, Allied Chemical Corporation, presented this address at the National Fertilizer Solutions Association Convention in St. Louis, Mo., November 10, 1959.

solution—the farmers are used to seeing it water white." This manufacturer is currently using wet-process acid. More recently another producer said "our farmers prefer the milky color—they can see what they are getting." I mention these instances simply to illustrate that the color factor is what *you* make it. The crops can't tell the difference.

While considering this matter of precipitation it should be pointed out that TVA has done, and is continuing to do, considerable work on the use of superphosphoric acid as a sequestering agent to prevent precipitate formation. A number of you may have experimented with this acid.

Another point that may be of interest to you is what some liquid manufacturers have referred to as "trace elements." You will recall that I pointed out that wet-process acid contains various materials that are extracted from the phosphate rock. These include iron, aluminum, and a number of the other elements such as manganese, boron, copper and magnesium. One particular liquid manufacturer was very anxious to have a complete analysis of the acid listing all these elements so as to be able to prove that his product was not lacking in the trace materials normally found in dry fertilizers. These small amounts of materials are present, and may be useful, although they do not provide a total correction for all deficient soils.

THE CALCIUM SULFATE PROBLEM

The matter of sediment in Green Acid is still another area that may be of interest to you. As I mentioned earlier, a by-product of wet-process acid manufacture is calcium sulfate. Phosphoric acid seems to have an infinite capacity for remaining very much super-saturated with calcium sulfate. This material has the characteristic of almost endlessly dropping out of solution. In the early days there were some problems with the calcium sulfate settling out in tank cars and storage tanks. Ways have now been found to prevent this settling out. In fact, our specifications permit far less than one-half per cent of such material at time of shipment.

Now what about the availability, or supply, of purified Green Acid? Because of the demand for this product, for economic and quality reasons, we have had to face a good many problems which are inherent in your industry as well as ours, and which must be successfully met if the supply of acid is to meet the demand.

A brief consideration of chemical economics will indicate to any of you that it would not be practical to run an expensive manufacturing unit several months a year, and let it sit idle for the balance of the year. This would entail astronomical costs. The obvious answer, of course, is to run the plant all the time. This immediately raises the question as to what to do with the acid steadily streaming out of acid plants during the months when you folks do not need it.

We should therefore consider storages for phosphoric acid. Right today, while we are expanding our production facilities, we are also installing additional substantial storages. We believe, however, that it would be impractical for any acid manufacturer to put in enough storage to hold his entire production in the off months, so that it would be available to you when you need it in the spring and fall. Even if all the acid were stored, the matter of having enough tank cars or tank trucks to deliver the acid during your period of high demand would present another major problem. The obvious method of alleviating the acid supply situation is for our industry and your industry to work out operations so that we can produce and deliver acid to you throughout the year. We fully appreciate your position when the farmers are calling for fertilizer, and at the same time you are unable to supply it because of acid shortage. We have found ourselves in this same unfortunate position when you needed acid and we could not provide it. Accordingly, we think that each of you who is interested in preserving, or acquiring, an assured supply position should put in sufficient storage so that you can receive acid on a regular monthly basis throughout the year.

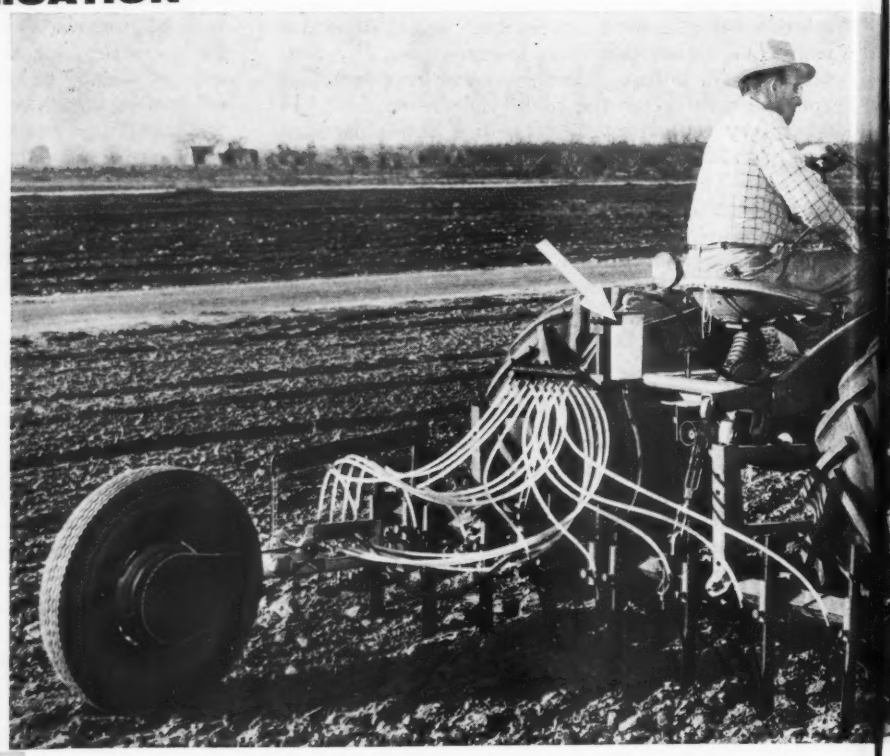
HERE'S A SIMPLE STORAGE UNIT

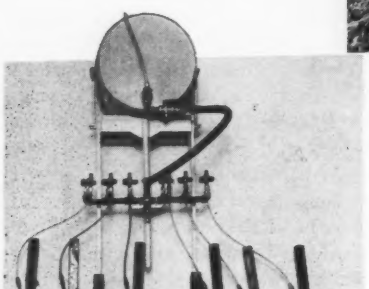
This suggestion may seem to pose a financial problem, even though justified by your supply requirements which may not have always been met to your entire satisfaction in the past. The financial aspects in connection with acid storage have also been of concern to us. We, therefore, made storage facilities the subject of a very considerable investigation by our corrosion laboratory and construction engineers, working as a team. As some of you who are present know, an approach which appears to be practical, and which is inexpensive in nature, is at hand. We have developed materials of construction, and methods of using them, which we believe will enable you to store purified wet-process acid without chemical deterioration for an indefinite period of time; and at a cost of construction many times less than what you would pay for rubber-lined steel or stainless steel storages of corresponding capacity. To give you an idea of costs, it now seems possible to store this type of acid to the extent of perhaps 400 tons for roughly $5000—or even less.

A schematic drawing of a typical pool-type storage is shown above. The ground is hollowed out by a bulldozer, with the soil removed being used to build up the sides. After the basin is prepared, the bottom and sides are coated with a membrane of multi-layered burlap and asphalt. The storage basin is covered with a roof to keep out rain, and foreign matter.

I have tried to give you a picture of what wet-process, or Green Acid, is and to point out that it is being widely and successfully used. I have discussed your major problem with regard to acid and have suggested what appears to be a practical answer to it. I hope that I have also been able to explain some of the problems which confront us. In conclusion, I believe it is safe to say that Green Acid will play an increasingly important part in the exciting new field of liquid fertilizers. ▲

MATERIALS HANDLING
CUSTOM APPLICATION





Above: Tractor equipped with gravity flow system. Arrow indicates flow tank.

Shown at left is a constant-head tank for use in gravity flow system.

Below left: Hand-operated spot injector.

Below right: Experimental pump-pressure orifice system. The machine must be operated at fixed speed across the field to obtain given rate of application.

THE DEGREE of control required from nematocidal treatments, application methods and rates vary from crop to crop. Less than 10 nematocides are available commercially, and only three or four of those were introduced within the past 15 years. Some nematocides are distributed in the soil by diffusion in the gas or vapor state, by water solutions or emulsions, or by mechanically mixing the chemical into the soil. Whatever the method, the chemical must be dispersed through the soil to kill nematodes to the desired depth, without leaving a phytotoxic residue.

Nematocides volatile enough to move through the soil in the vapor

From "California Agriculture," September, 1959, published by the University of California, Division of Agricultural Sciences.

By BERT LEAR and N. B. AKESSON*

Applying NEMATOCIDES

The authors describe several effective nematocides which lend themselves in various forms to liquid and granular application for field use on perennial and annual crops.

or gaseous state are most effective and include ethylene dibromide, dichloropropene, dichloropropene-dichloropropane mixtures, and dibromochloropropane. These materials may be applied without surface cover or water seals; rolling or harrowing the soil following treatment to fill in injection furrows is sufficient.

Ethylene dibromide—1,2-dibromoethane—a heavy, colorless liquid with a chloroform-like odor, is very effective against nematodes, wireworms, and certain insects. First reported as an effective nematocide in 1945, ethylene dibromide has become one of the most widely used preplanting soil fumigants. For the application of doses of 1–4 gallons per acre, various formulations are available, containing from 5% to 83% ethylene dibromide by weight. The diluent is usually some inexpensive petroleum thinner or xylene.

Dichloropropene—1, 3-dichloropropene—is available by itself or as a mixture containing 1,2-dichloropropane. The dichloropropene-dichloropropane mixture, first reported as a nematocide in 1943, is a standard field nematocide. This material is a clear to amber colored liquid and weighs about 10 pounds per gallon. This was probably the first material cheap enough and effective enough for field-scale use and is more effective than ethylene dibromide against certain nematodes, such as the cyst-forming species.

Dibromochloropropane—1, 2-dibromo-3-chloropropane—the newest member of this group of chemicals, was introduced in 1955 and, for the first time, an effective nematocide that can be injected into sites of certain living plants without injury, became available. This is a heavy, straw-colored liquid with a very low vapor pressure. It is an effective nematocide at rates as low as one-half gallon per acre. The most common formulation, among many available, contains 25% by volume in petroleum thinners.

Applications of these three chemicals usually are made by chisel injection of the liquids 6″–8″ deep in rows or furrows. For a broadcast application—also referred to as solid, and over-all application—the furrows are 12″ apart. In some cases, as in citrus where large doses are applied, the chisel spacing may be as much as 18″ to 24″.

Chloropicrin—trichloronitromethane—and methyl bromide—bromomethane—are highly volatile materials and to obtain maximum control some type of surface seal, such as covering the treated area with gas-impervious cover or sprinkling the surface with water, must be used. These chemicals are expensive and their use has been limited to crops of high value such as those in plant beds and greenhouses.

Chloropicrin is a tear gas, toxic to humans and to a wide range of organisms including nematodes. Introduced about 25 years ago, this material probably was one of the first commercial soil fumigants. Its use was limited to greenhouses, and to certain specialized field applications. It is a colorless liquid whose vapor causes intense irritation of eyes and throat.

Methyl bromide is a colorless gas and almost odorless. This extremely volatile chemical may be applied to the soil surface under gas-impervious covers such as polyethylene films. Also it may be dis-

*Bert Lear is Associate Nematologist, University of California, Davis.
N. B. Akesson is Associate Professor of Agricultural Engineering, University of California, Davis.

solved in diluents such as petroleum thinners having higher boiling points, thus allowing its injection by conventional methods. A surface cover is essential to obtain control with this material. Methyl bromide was first reported as a nematocide in 1940 and its use is confined—because of high cost—mainly to high value crops. It is toxic to a wide range of fungi, weeds, and nematodes, and has excellent penetrating abilities into roots and other plant tissues. Some formulations contain a trace of chloropicrin as a warning agent.

The use of irrigation water to carry nematocides into the soil has resulted in control with some newly introduced water soluble materials such as sodium methyl dithiocarbamate. Limited distribution of this chemical has been obtained by diffusion through injection. Applications in water, furrow, overhead sprinkler, and flooding have given control. However, best control resulted when the material was flooded onto the soil in water contained by basins. Emulsifiable concentrate formulations of other materials, especially dibromochloropropane fumigants, are being used by mixing them in the irrigation water as it enters the field. The method of applying nematocides in irrigation water is still under investigation.

Chemicals in granular form which must be mixed with the soil have not been so successful as other types. Potting soils have been successfully treated in this manner because thorough incorporation in the soil is possible. Mechanical tillers and discs have been used, with some success, to apply such chemicals to seedbeds. Sometimes deeper penetration has been accomplished by a combination of mixing and subsequent application of water either from rainfall or irrigation.

Crops

Application rates are usually designed for a minimum dose to permit an economic crop. Because of the narrow margin of profit in annual vegetable and field crops—for example—treatment costs make the use of higher doses of nematocides impracticable. However, it is recognized that treatment is necessary before each planting and savings are sometimes realized by row or spot applications.

High costs of establishing perennial plantings such as tree and vine crops, make expenditures for soil treatments feasible. Some of these crops are in production for 20 years or longer and it is important that a productive planting be established. Removal of plants after two or three years and replanting cause losses that justify considerable expenditures for nematocidal treatments. Tree and vine crops also offer the most opportunities for post-planting side-dress treatments.

Most nursery plantings—trees, vines, ornamentals, strawberries, and tomato transplants—are of relatively high value. Consequently, treatments with methyl bromide, chloropicrin, and more recently, sodium methyl dithiocarbamates, are routinely applied even though the cost per acre may be in the range of $500. Because California's quarantine laws prohibit the movement of plants infested with nematodes, plant nurseries fumigate with high rates of nematocides so their crops may be marketed without restriction.

Soil type, tilth, moisture, and temperature are factors influencing nematode control with chemicals. The kind of nematodes present, and nondecomposed root tissues in the soil also are important factors.

Soil type is probably the most limiting factor associated with efficacy of a fumigant. Chemicals are much more efficient in sandy and sandy loam soils than in the heavier clay soils or in peat or muck soils. Diffusion of chemicals is restricted in clay and silt soils mostly by sorption on the surface of the very small particles. High water-holding capacities of the peat and muck soils also retard the movement of chemicals in these soils, and make it necessary to increase the amount of chemicals applied to obtain control.

Soil tilth by proper preparation prior to treatment is very important to successful application. The soil should be chiseled or plowed to a depth of at least 10″ with all old roots removed and clods pulverized. In other words, ideal seed-bed condition will provide the best conditions for treatment.

Soil moisture must be considered because application of chemicals to soils which are excessively wet or dry will result in poor nematode kills. Excess water restricts the movement of nematocides through the soil, whereas too dry a soil allows the chemicals to escape too rapidly. Certain nematodes, such as *Ditylenchus dipsaci*, are more difficult to kill when relatively dry.

Soil temperature also is important. Most effective results have been obtained when temperatures are between 50°F. and 75°F. The rate of movement at lower temperatures is slow and at higher temperatures there may be too rapid a movement out of the soil to effect maximum kills.

Application Equipment

Equipment for nematocide application follows the general design of pesticide sprayers, dusters, and granule applicators and is also similar to fertilizer application devices. However, one important difference exists which greatly alters the equipment requirements. This is the very low application rate at which it is possible to apply nematocides, particularly in row or band type applications where rates as low as one-half gallon per acre have been used. For area applications, three to 20 gallons per acre are usual, depending on material used and plants being treated. Low application rates make it necessary to use precision metering equipment and to follow careful calibration or determination of application rates.

Most of the early plotwork and trial applications were made with hand-operated spot injectors which are punched into the soil at measured intervals and a metering pump squirts a fixed amount of liquid into the soil through a hollow shank. Hand-operated spot injectors have the advantage of not damaging planted crop roots as do tillage type tools. Two machines for spot injection have been developed. One is a large-diameter wheel with radial, hollow spikes or spoke extensions which penetrate the soil and through which liquids

may be injected. The second machine is a high pressure nozzle injector operating at the soil surface to squirt measured amounts of liquid into the soil at given intervals. The two machines are experimental but hold promise for future development.

The most frequently used application system is by means of injection following a chisel furrow opener. The liquid metering system may be: *1*, pressure orifice with gas or pump pressure source, *2*, gravity orifice or gravity capillary tube, *3*, metering pump of either low pressure nonpositive displacement or positive displacement type.

The pressure orifice system depends on compressed gas or a pump handling the liquid for the pressure in combination with a metering orifice which passes a fixed amount of liquid for a given pressure. The machine must be operated at fixed speed across the field in order to obtain the given rate of application. This system is satisfactory for rates above five gallons per acre but at lower rates the very small metering orifices—as small as 0.014" diameter—easily clog or alter discharge rates with physical variations of the liquid. To handle corrosive liquids, all metal parts should be stainless steel and hoses made of polyethylene.

The gravity flow system may use an orifice or needle valve metering device and, with very low head pressures—of the order of 1′ or 2′—the orifice openings can be larger than with higher pressure devices for a given flow rate. However, the coiled tube of plastic or metal which acts to retard flow provides an even larger passageway for a given flow rate, thus reducing the plugging problem. Gravity flow systems require a constant-head type tank or a float tank, to maintain constant head or pressure on orifice or tube.

Use of Metering Pump

The metering pump is commonly used for positive injection of fertilizer liquids, in which case a positive displacement piston or rotary pump is used. However, a loose-fitting nonpositive gear pump with separate gears for each shank has been developed which is low in cost, has low wear features and provides separate metering for each shank. This system is self-compensating for changes in tractor speed, to a limited extent within the range of linear relationship between flow rate and pump rotational velocity. Because of the loose fitting gear system, a constant-head tank must be used. A vacuum break or anti-siphoning opening should also be provided or else liquid will be siphoned through the pump when stopped.

In any system of gravity feed and loose-fitting gear, the air vent will prevent siphoning and reduce air lock problems. Also, when the vent is used the pressure head becomes the difference in levels from the tank bleed to the vent.

Dusts are little used for nematocide formulation, but granulars made up in the usual size range of 15 to 60 mesh have been found satisfactory for many applications.

Granular materials are more easily handled than liquids, less volatile, and lend themselves to low metering rates. The usual fluted feed seeder device, augers, chain feeds, endless belts, revolving plates and simple paddle over orifice systems will handle rates as low as two pounds per acre at 12" spacing. The endless belt and double revolving plate types have perhaps the greatest accuracy of the several systems. In recent years, fertilizers and nematocide materials have been made up in granular combinations. Any of the better fertilizer-type metering devices is suited to these materials; the revolving plate, endless belt, and simple agitator over orifice are commonly used.

Injection into irrigation water may be accomplished simply by dripping the nematocide into the flowing ditch at a rate consistent with water flow, or by injecting with a pressure pump and controlled orifice into the sprinkler pressure line. Numerous other systems of injection by aspirators, and differential pressure systems such as are available for fertilizer injection can be used. The principal problem is to obtain a low flow rate for a given volume of nematocide applied over a given portion of the irrigation period. As this is not critical, metering need only be approximate. However, too much material applied in a short time might prove to be phytotoxic to plant surfaces.

NFSA CONVENTION

(Continued from page 26)

5) Consensus is that commitment to distributors and dealers will be met.

Why did we have temporary shortages? There are many reasons. A few of the possible causes are:

1) Highly seasonal nature of the market.

2) Inaccurate reporting of tonnage figures to state and federal agencies.

3) Incorrect market forecasting on the part of suppliers.

4) Unfavorable weather conditions early in the spring season resulting in very high "peak season" demands.

5) Light fall movement resulting in production curtailment during the "off season" period.

6) Increase in farm income.

7) Removal of corn acreage controls resulting in approximately 15% increase in corn acreage.

8) Plant failures or breakdowns during the rush season.

What can the dealer do to assure better service to his customers? Tuning suggested:

1) Make full use of the storage available. Start the season with full tanks, and replace material as tonnage is sold.
2) Start spring operations just as soon as soil and weather conditions will permit. Push hard on "off season" and pre-plant application.
3) Unload tank cars fast and return to your supplier. The maintenance of a tank car fleet is very expensive and there just is not enough equipment to deliver capacity tonnages if that tonnage has to be delivered in a 60 day period. Hoarding of tank cars at the dealers place of

FERTILIZER SOLUTIONS ASSN. CONVENTION

(*from preceding page*)

business results in a lower total tonnage movement in a given period of time.

"I assume suppliers *could* provide sufficient storage for the entire years production at various points. I am sure however that under such a plan the cost of product to you and the user would increase materially, "he said.

THE IMPORTANCE OF EARLY MOVEMENT

He illustrated just how important this early movement can be. Storage, time of movement and total supply available are very closely related. Suppliers, distributors and dealers will all have to share the responsibility for orderly marketing.

"Let us assume that our nitrogen plant has the capacity to produce 5,000 tons of nitrogen solution per month or 60,000 tons per year," he explained.

On the table he had small containers each of which represented a month's capacity or 5,000 tons.

"If sales equal production month after month we would have no need for storage; but as we have seen, this is not the case with reference to nitrogen solutions," he went on.

"Now let us place three additional containers on the table, the first representing "sales", the second "storage", and the third "loss of production". For the sake of illustration let us assume on June 30 that all storage facilities are empty as is this container.

"July finds the farmer side-dressing corn and top-dressing this crop or that one resulting in a considerable amount of July sales. Production however overruns sales so some goes into plant storage. August and September finds the dealer manufacturer replenishing his supply taking advantage of fall discount prices and preparing for his fall business, thus we add to the sales column. But as in July, sales fall behind production resulting in an addition to plant and field storage.

ROUTING TO STORAGE

"Then comes the second quarter, October, November, December when much of product may be routed to storage. A few tons however are being sold during the fall fertilizer season.

"January's production we will say goes to storage which more than fills the existing capacity we have here at our imaginary plant. Since sales for the product are limited, this remaining portion is considered "loss of production".

Things begin to move in February, especially in the south, sales pick up, but still do not require the full capacity of our 5,000 tons per month plant, meaning that another 2,000 tons are lost due to "full storage". March sees product movement picking up. Farmers are beginning to stir in the cornbelt, small grains are being sown, with this increased activity sales equal production.

April, May and June are practically identical. Here certainly is the peak demand for our product. We ship both out of storage and production to supply the demand."

While the use of fertilizer is increasing at a fast rate, use of liquid fertilizers is increasing faster. That's what O. L. Ohnstad of Ohio Liquid Fertilizer, Inc., South Solon, Ohio had to report in his president's report. He told the group that the number of "liquid" plants had more than doubled in the past two years.

Ohnstad was enthusiastic about the use of ammonium phosphate for fire fighting on the farm. He said that the farmer has a built-in fire department with ammonium phosphate.

He said that the association now has 208 members, an increase of 46 members since the 1958 meeting.

Ammonium phosphate for fire-fighting was thoroughly explained in a special address by George Dole of Monsanto Chemical Co. He listed the states where experiments along this line are being run. They include: Georgia, Missouri, Florida, North Carolina and Mississippi. Dole said:

"This is an excellent way of introducing liquid fertilizer to the farmer."

"WINNING OVER" THE FOREST PEOPLE

He pointed out that it was the forest people that they are really attempting to "win over" at the present time. He said that the Forest Products Laboratories in Wisconsin are conducting extensive research with ammonium phosphate.

"Eliminating Those Sales Barnacles" was the interesting topic of Vern Martin, sales consultant, Newton, Iowa. He said that a good product is essential, but it's secondary to *selling*.

Some of the bad practices (barnacles) of salesmen which affect the sales program (the speed and efficiency of the ship) are: 1) lack of enthusiasm, 2) being a poor listener, 3) failure to say "thank you," 4) lack of sustained effort, 5) lack of tact, 6) "bisuness" (putting the "I" before the you ("U"), 7) failure to put service before self, 8) talking in generalities—not in specifics, 9) failure to sell all the benefits, 10) no organized plan for prospects, 11) failure to treat objections as questions, 12) failure to use the user (let the user tell your story), 13) failure to make a test closing (never ask a question that can bring the answer "no").

In other talks James L. Brown, Monsanto Chemical Company, explained the increasing number of plants and tonnages in *phosphates* and Edwin C. Kapusta, United States Borax & Chemical Corp. brought out the need for more storage space, in explaining the *potash* situation.

H. H. Tucker, Sohio Chemical Company, discussed formulations in liquid fertilizers. He brought out the need to be more exact in the amounts of urea and/or ammonium nitrate which are used because this relationship also affects solubility. He went on to fully describe urea as the "preferred source of supplemental nitrogen" for the liquid industry. Tucker explained the triangular method of calculating nitrogen formulations. ▲

Note: Elsewhere in this issue you will find the talks of William S. Newsom Jr., International Minerals & Chemicals Corporation and F. M. Batson, General Chemical Division, Allied Chemical Corporation, featured. They spoke on "Suspension Fertilizers" and "Wet Process Phosphoric Acid in Liquid Fertilizers", respectively.

NEWS OF THE INDUSTRY


Miller


James


Machen


Moore


Shelburne

ARMOUR AGR. CHEMICAL CO. ORGANIZATION REALIGNED

Major organizational realignment of Armour Agricultural Chemical Co. has been announced by W. E. Shelburne, president. The Atlanta-headquartered company is being organized into two major divisions —Fertilizer and Nitrogen-Phosphate.

The Fertilizer Div. will include Armour's 27 complete fertilizer manufacturing plants in the United States as well as one in Cuba and one in Puerto Rico.

The Nitrogen-Phosphate Div. will include Armour's newly-acquired nitrogen plant in Crystal City, Mo., and phosphate mining and processing facilities in Bartow, Fla., and Columbia, Tenn., and a triple superphosphate manufacturing plant at Bartow.

Appointed to newly-created positions under the new organizational structure are H. Vise Miller, of Atlanta, named vice president and general manager of the Fertilizer Div.; Robert L. James, of Atlanta, vice president and general manager of the Nitrogen-Phosphate Div.; Bernard M. Machen, of Crystal City, Mo., sales manager of the Nitrogen Div., and John E. Moore, of Atlanta, assistant to the president.

IMC REPORTS ON QUARTER

International Minerals & Chemical Corp. has reported net earnings of $537,000 for the first fiscal quarter ended September 30, 1959, equivalent to 19 cents per share on the 2,363,237 common shares outstanding. This compares with a net loss of $38,000 or 6 cents per share on the 2,340,227 common shares outstanding for the corresponding period a year ago.

Sales for the quarter just ended were $22,416,000, up 11 per cent over the $20,163,000 total for the first quarter a year ago.

CENTRAL CHEM. SELLS VIRGINIA PLANT

Central Chemical Corp. of Hagerstown, Maryland, has sold its fertilizer plant in Harrisonburg, Va., to Southern States Cooperative for about $400,000, according to a recent report. The price also includes approximately 20 acres of land and a storage warehouse at Cimora, Va., six miles north of Waynesboro, Va.

Southern States announced it will sell bulk as well as bagged fertilizers to farmers in the Rockingham-Augusta county area. The plant has a rated capacity of about 30,000 tons a year.

STAUFFER DECLARES INCREASED DIVIDEND

Directors of Stauffer Chemical Co. have increased the regular quarterly dividend rate from 25 cents to 30 cents and declared a cash dividend of 30 cents per share of common stock payable Dec. 1 to stockholders of record at the close of business Nov. 13, 1959. A cash dividend of $.875 per share of preferred stock is payable Dec. 31 to stockholders of record at the close of business on Dec. 11, 1959.

A 2 per cent stock dividend on common stock payable Dec. 31 to stockholders of record at the close of business on Dec. 2 also was declared by directors.

ORGANIC PESTICIDE OUTPUT INCREASED 5% IN 1958

U. S. production of synthetic organic pesticides and other organic pesticides totaled about 539 million pounds in 1958, an increase of approximately 5 per cent over the 512 million pounds reported by producers in 1958, according to a preliminary report of the U. S. Tariff Commission. Sales were up about 8 per cent, from 433 million pounds to 467 million pounds.

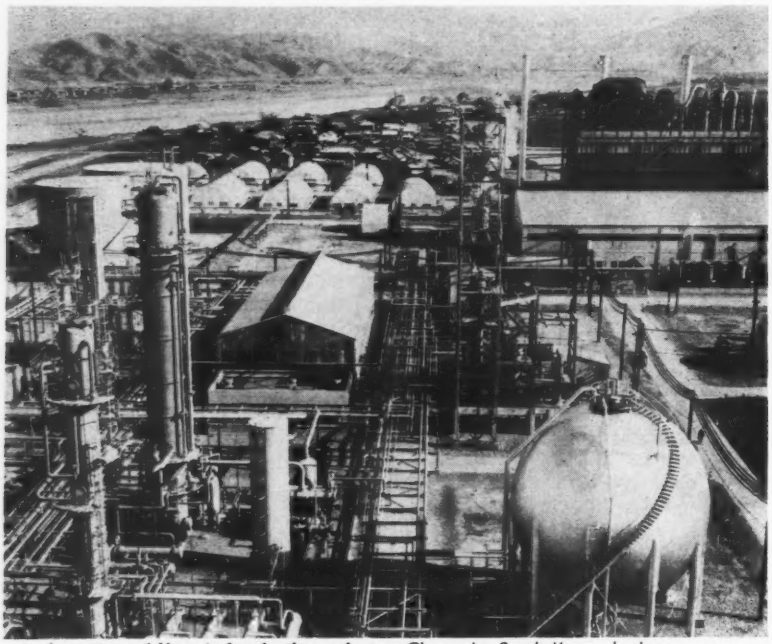
DDT production jumped significantly, from 124,545,000 pounds in 1957 to 145,328,000 pounds in 1958. Sales were 145,191,000 pounds. The high rate of production and sales was due in considerable measure to antimalarial programs of the International Cooperation Administration, World Health Organization and Pan American Sanitation Bureau.

Benzene hexachloride and lindane declined in both production and sales in 1958, but producers feel that 1959 sales will improve. These insecticides dropped from a combined production of 39.5 million pounds in 1957 to 30.7 million pounds in 1958, attributable to vigorous competition from malathion, the parathions and toxaphene as cotton insecticides, as well as to declining cotton acreage, the Tariff Commission reported.

Methyl parathion production rose from 1.9 million pounds in 1958 to 5 million pounds in 1959. This increased production, attributed partly to additional capacity and reduced prices, resulted in a decline in imports of methyl parathion from 1.5 million pounds in 1957 to 587,000 pounds in 1958. Ethyl parathion production dropped from almost 6 million pounds in 1957 to 5.4 million pounds in 1958; imports also dropped, from 760,000 to 360,000 pounds.

INCORPORATIONS

International Fertilizer Limited, 500 Fifth Ave., New York 18, N. Y. has been granted a charter of incorporation listing capital stock of 300 shares, no par value. Directors are John T. Sullivan, Cecile P. McDonald and Harold W. Conroy of 14 Wall Street, New York 5. Filer of papers: Cadwalader, Wickersham and Taft, of 14 Wall Street.



A section of Korea's first fertilizer plant at Chung-Ju, South Korea, built at a cost of $40 million. Financed mainly by U. S. International Cooperation Administration, the plant began operations late in October. It is expected to save Korea $1 million in foreign exchange each year, and will produce 250 metric tons of urea fertilizer daily. Builders were F. H. McGraw and Co. and Hydrocarbon Research, Inc.

MERGER OF STAUFFER AND VICTOR CHEMICAL APPROVED

Merger of Victor Chemical Works into Stauffer Chemical Co. has been approved by stockholders of both companies.

Of the 7,247,452 shares of Stauffer common stock outstanding, 6,683,218 shares or 92.2 per cent were voted in favor of the merger, 12,980 shares or .2 per cent were voted against.

Of the 1,697,101 shares of Victor common stock outstanding, 1,448,847 shares or 85.4 per cent were voted in favor of the merger and 3,815 shares or .2 per cent were voted against. Of the 57,184 shares of Victor preferred stock outstanding, 49,745 shares or 87 per cent were voted in favor of the merger and no shares were voted against.

Victor operations will be continued as Victor Chemical Div. of Stauffer Chemical Co., under the same management.

CSC REPORT FOR 3rd QUARTER, 9 MONTHS

For the quarter ended Sept. 30, 1959, consolidated net earnings of Commercial Solvents Corp. were $917,749 equal to $0.33 per share on 2,741,422 shares of common stock. For the same 1958 period, earnings were $321,605, or $0.11 a share. Sales for the quarter were $19,348,071, against $18,276,682 for the similar 1958 period.

The firm reported consolidated net earnings for the nine months ended Sept. 30, 1959, of $2,285,061 equal to $0.83 per share. This compares with $0.38 for the first nine months of 1958. Sales reached $51,822,428, against $46,688,819 in the nine-month period of 1958.

DIAMOND ALKALI REPORTS PEAK SALES AND EARNINGS

Diamond Alkali Co. has reported new peak sales and earnings for the third quarter of 1959 and also for the nine months ended Sept. 30, 1959.

Third quarter sales totaled $36,418,589, a 29 per cent increase over 1958 sales, and net earnings amounted to $3,134,376, nearly twice the reported earnings for the corresponding 1958 period. These earnings are equivalent to $1.12 a common share compared with the $0.58 a share reported for the third quarter of 1958.

Sales for the first nine months of 1959 were $102,341,211, compared with $84,493,991 reported the same time a year ago. Earnings for the nine months ended Sept. 30,1959, totaled $8,335,939, an increase of 108 per cent over the $4,010,331 earned in the same 1958 period.

AG POTASH DELIVERIES INCREASE 6 PER CENT

Deliveries of potash for agriculture in the United States, Canada, Cuba, Puerto Rico and Hawaii by eight principal American producers and the importers totaled 2,819,951 tons of salts containing an equivalent of 1,655,018 tons K_2O during the first nine months of 1959, according to the American Potash Institute. This was an increase of 6 per cent in salts and K_2O over the same period in 1958.

Continental United States took 1,559,781 tons K_2O; Canada, 53,356 tons; Cuba, 5,381 tons; Puerto Rico, 18,389 tons; and Hawaii, 18,111 tons K_2O. These figures include imports of 112,339 tons K_2O for only the first six months of the year. Exports to other countries were 204,979 tons K_2O.

Deliveries of potash for non-agricultural purposes totaled 107,743 tons K_2O, up 33 per cent from last year.

CALSPRAY OFFICE RELOCATED

Relocation of California Spray-Chemical Corp.'s Middle West headquarters from Maryland Heights, Mo., to Des Moines, Iowa, was recently put into effect.

TWO NEW PLANTS PLANNED BY COLLIER CARBON

Collier Carbon and Chemical Corp. reports it will build facilities to produce sulfuric acid and ammonium sulfate near Wilmington, Calif., on an 11 acre site secured under long term lease from Union Oil Co. of California.

One unit, a contact acid plant, will convert hydrogen sulfide, sulfur and spent alkylation acid into virgin sulfuric acid. The other new plant, Collier said, will be an improved process utilizing fresh acid and producing a premium grade of ammonium sulfate.

Both plants are scheduled for completion late in 1960.

SMITH-DOUGLASS SALES AND EARNINGS FOR YEAR RISE

For its operating year ended July 31, 1959, Smith Douglass Co. reports net sales of $45,926,007, as compared with $39,887,737 in the prior year. Net income after taxes was $2,749,079, against $1,475,080 for operating year 1958.

Net earnings per common share were $2.75 as compared with $1.45 last year. The board declared a quarterly dividend of 30 cents per common share payable November 20 to shareholders of record on Oct. 30, 1959.

FARM FERTILIZERS BUYS WEBSTER CITY, IOWA, PLANT

All of the real estate and physical assets of Agricultural Products Corp. of Webster City, Iowa, have been acquired by Farm Fertilizers, Inc., reports R. E. Bennett, FF president. Additional facilities are being installed at Webster City, Bennett said.

$4 MILLION PROGRAM BEGUN BY THOMPSON-HAYWARD

Plant, warehouse and headquarter operations of Thompson-Hayward Chemical Co. at Kansas City will be consolidated on a recently acquired industrial tract in Wyandotte county, Kansas, under a five year program now under way. The entire program will require an expenditure in excess of $4 million, with $2.5 million being spent in the initial phase for new offices, warehouses and one of six plants eventually to be moved to the new site, said Robert S. Thompson, president. First units are scheduled for completion in the early fall of 1960.

When completed, the program will more than double present executive and general office space at Kansas City, as well as expand and modernize distribution and manufacturing facilities.

DU PONT WILL BUILD NEW PLANT FOR METHYLAMINES

A new plant to make methylamines, basic chemicals used in manufacturing farm chemicals, rocket propellants, textile fibers and dyes, rubber chemicals and pharmaceuticals will be built at the Du Pont Co.'s Belle, W. Va., site, the company has announced. The plant will more than double Du Pont's capacity for methylamines, now made at the Houston, Tex., Works, according to Clark W. Davis, general manager of the company's Industrial and Biochemicals Dept.

Construction by the company's Engineering Dept. will begin early next year with completion expected in the first quarter of 1961.

McCONNON FAMILIES SELL ALL THEIR COMMON STOCK

Majority interest in McConnon & Co. has been sold by the James and H. G. McConnon families to five Winona businessmen. Richard G. Vickery, formerly president of Knight & Bostwick has been named vice president-general manager.

All common stock formerly owned by the McConnon families has been acquired by the five-man group which has, at the families' request, served as the corporation's board of directors since a reorganization of the management in 1956.

The five, all of whom have served without compensation the past three years, are B. A. Miller, president, Miller Waste Mills; E. H. Finkelnburg, chairman, board of directors, Mississippi Valley Public Service Co.; J. H. Baker, president, Baker Shoe Co.; F. O. Gorman, president, The Gorman Co.; and George E. Kelley, executive vice president, Bay State Milling Co.

McConnon & Co. was organized in 1899.

SEAWAY CHEMICAL CORPORATION FORMED

Formation of Seaway Chemical Corp., an Illinois corporation, has been announced by Jerome Kritchevsky who, until recently, was vice president and export manager of Stepan Chemical Co. The firm will be an export-import agency specializing in chemicals and will also represent Stepan in foreign markets.

Kritchevsky

Offices of Seaway will be at the Stepan address, 427 W. Randolph St., Chicago, until next spring when Stepan moves to its new building in Northfield, Ill. At that time Seaway will relocate at 111 W. Monroe St., Chicago.

STAUFFER CHEMICAL REPORTS RECORD SALES, EARNINGS

Stauffer Chemical Co. reports record sales and earnings for the third quarter and for the first nine months of 1959.

Net earnings for the three months ended Sept. 30, 1959 were $4,348,000 or $0.60 per share, an increase of 15 per cent over the third quarter 1958 earnings of $3,777,000 or $0.52 per share. Third quarter sales increased 5 per cent to $44,484,000 from $42,525,000 in the corresponding period last year.

For the first nine months of 1959 net earnings were $13,496,000 or $1.86 per share, compared with $10,725,000 or $1.48 per share (excluding net non-recurring income of $0.08 per share) for the same period in 1958. Sales for the first three quarters were $131,351,000. During the first nine months of 1958 sales were $122,146,000.

SPENCER SALES, INCOME SUBSTANTIALLY IMPROVED

Both sales and net income of Spencer Chemical Co. for the three months ended Sept. 30 were reported to have substantially improved over the corresponding period of a year ago. The increases resulted from greater sales volume in all three of the company product divisions—plastics, agricultural and industrial chemicals—and from improved prices for nitrogen products, according to Kenneth A. Spencer, board chairman.

Net sales for the quarter were $14,265,102, compared with $11,961,025 a year earlier. Net income amounted to $1,338,627, equal to $1.06 a common share, after preferred dividends, compared with $720,008 or 52 cents a share, a year ago.

VALLEY NITROGEN TO BE TAX PAYING COOPERATIVE

Carl H. Haas, president, reports that at a special meeting of the board of directors of Valley Nitrogen Producers on Oct. 22, "the board elected to be treated as a tax-paying cooperative, although under provisions of Section 521 of the Federal Internal Revenue Code of 1954, Valley Nitrogen Producers, a fully farmer-owned cooperative, was entitled to claim exemption from Federal income taxation."

GOVT. CONTRACT AWARDS

Baird and McGuire, Inc., Halbrook, Mass., was awarded a $46,948 prime contract to supply lindane to the U. S. Navy Purchasing Office, Brooklyn, New York.

Diamond Alkali Co., International Div., New York City, has been awarded a $42,780.92 prime contract for 167,900 pounds of DDT 75 per cent water dispensable powder by the General Services Administration, Washington, D. C.

Howard Fertilizer Co., Orlando, Fla., has been awarded a prime contract to supply 260 tons of fertilizer at $35.63 per ton to Patrick Air Force Base, Cocoa, Florida.

Montrose Chemical Corp. of California, Newark, New Jersey, has been awarded $43,729.74 and $228,420 prime contracts to supply 172,000 pounds and 900,000 pounds, respectively, of DDT 75 per cent water dispensable powder to the General Services Administration, Washington, D. C.

Superior Products Co., Oakland, Calif., has received a $7,728.75 prime contract to supply insecticides to the U. S. Navy Purchasing Office, Brooklyn 32, New York.

Trio Chemical Works, Inc., Brooklyn, New York, has received a $2,144 prime contract to supply dieldrin to the Navy Purchasing Office, Brooklyn, New York.

GRACE TO EXPAND WOODSTOCK N PLANT

A major expansion of its nitrogen plant in Woodstock, near Memphis, Tenn., has been announced by William J. Haude, president of Grace Chemical Div., W. R. Grace & Co. Present capacity is 100,000 tons a year. Adding new capacity to the plant will bring yearly ammonia tonnage total to more than 160,000 tons. Mr. Haude said construction will get underway soon, and he expects completion of the enlarged section by 1961.

This expansion follows that of the urea section which doubled urea production during the fall of 1959.

HOOKER TO ESTABLISH NEW YORK CITY HEADQUARTERS

Hooker Chemical Corp.'s board of directors has voted to establish corporate headquarters in New York City some months hence, according to Thomas E. Moffitt, president. The decision involves only some 15 to 20 people in certain corporate departments out of approximately 461 corporate personnel and a total of about 2,550 employed by Hooker at Niagara Falls, Moffitt said.

Hooker has signed a lease agreement for the entire 34th floor at 666 Fifth Avenue, New York City, in a building completed less than two years ago. This will also accommodate the company's New York District sales offices now in the Lincoln Building. The offices should be ready for occupancy in late February or March, 1960.

ATLAS SALES OFFICE MOVE

On November 1, Atlas Powder Co.'s explosives and chemicals sales offices in San Francisco were moved to new quarters in San Mateo, Calif. New address: 2036 Pioneer Court, 20th Ave. Executive Center.

Associations Meetings

NEW MEXICO AG CHEM CONFERENCE JAN. 13

The third annual Agricultural Chemical Conference will be held January 13 at New Mexico State University, Dr. J. Gordon Watts, head of the Department of Botany and Entomology, has announced.

Results of research on insecticides, nematocides, fungicides, herbicides and fertilizers will be the general subjects of the conference.

New feature of the program will be presentations by teams of industry representatives with staff members of the Botany and Entomology and Agronomy Departments of NMSU Agricultural Experiment Station.

Frank Irons, principal agricultural engineer with the USDA Agricultural Research Service at Wooster, Ohio, will be guest speaker. He will discuss ground and air application of pesticides.

THREE FERTILIZER TRAINING SCHOOLS SCHEDULED IN KAN.

Three district Fertilizer Dealer-County Agent Training Schools are slated for Kansas the second week in December. Dates and locations are: Dec. 9, Chanute; Dec. 10, El Dorado; Dec. 11, Wichita. Sessions will start at 1:00 p.m. and continue through evening dinner.

Among subjects on the programs are "Kansas Crop Fertilizer Results for 1959"; "Review of Soil Testing"; "How to Use Soil Tests to Sell Fertilizer"; "Investments and Returns from Fertilizer"; "Possibilities of Financing Fertilizer Purchases"; "Fertilizer—Key to Efficiency."

Arlan D. Woltemath, National Plant Food Institute district representative, has cooperated with the University men and county agents in setting up arrangements for the schools

DEALER WORKSHOPS PLANNED ON USING NH_3 IN NEBRASKA

"Using Anhydrous Ammonia in Nebraska" is the subject of five dealer workshops sponsored by the Anhydrous Div. of the Nebraska Fertilizer Institute and the Agricultural Ammonia Institute. The one-day workshops will be held Dec. 7 in Lincoln, Dec. 8 at Hastings, Dec. 9 at Ogallala, Dec. 10 at Kearney and Dec. 11 at Columbus. The University of Nebraska, College of Agriculture, is cooperating in the workshops.

Among subjects to be discussed are technical data, business procedure, equipment and application, sales, advertising and promotion, insurance and safety.

Leo L. Johnson, field secretary for the Nebraska Fertilizer Institute, has invited fertilizer dealers, farm managers, county agents, soil conservationists, suppliers and equipment men to attend.

CSMA MEETING TO STRESS EFFICIENCY, MARKETING

Efficiency and marketing know-how are two themes to be stressed at the 46th annual meeting of the Chemical Specialties Manufacturers Association, December 7–9 at the Hotel Mayflower, Washington, D. C.

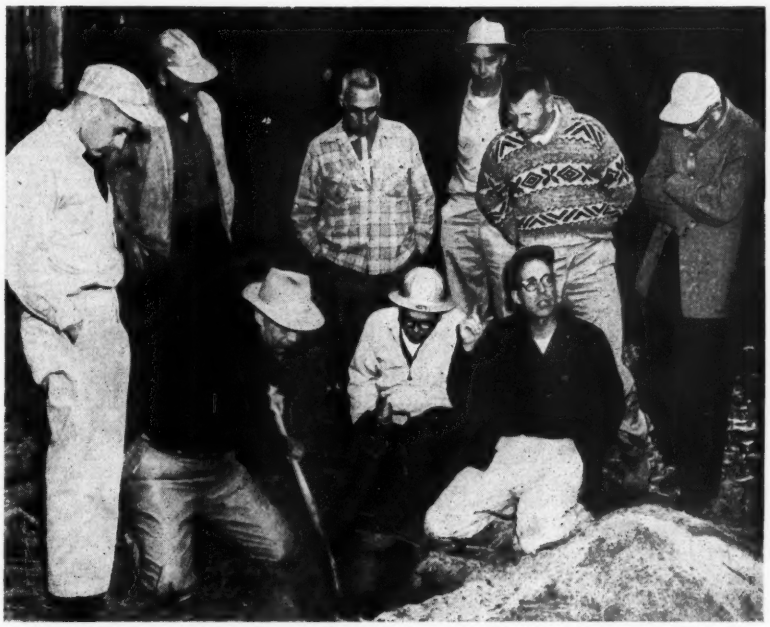
A symposium on non-agricultural spraying equipment will highlight a morning session of the Insecticide Div., Dec. 8. On the 9th, "Insect Resistance" will be reviewed by Robert H. Nelson, secretary of the Entomological Society of America; "Recent Developments in Insect Attractants" by Morton Beroza of USDA; and a marketing subject will be discussed by T. Carter Parkinson, McCormick & Co.

POTASH INSTITUTE AIDS PLANT NUTRITION RESEARCH

Through an $8,250 grant from the American Potash Institute, the Soils Department of North Carolina State College has launched a study on the role of potassium in helping plants utilize carbon from carbon dioxide in the air.

"The importance of such a study," says Department Head Dr. J. W. Fitts, "becomes apparent when we realize that plants are composed of about 40 to 45 per cent carbon which comes from carbon dioxide in the air."

The N. C. State scientist says, "One of the important roles of potassium in plant nutrition seems to be its ability to help plants take carbon from carbon dioxide and convert it into carbohydrates and proteins for high quality, high yielding crops."



Chet Youngberg, Oregon State College forest soils specialist, discusses pumice soils in Ponderosa pine area at recent Agro-Forestry meeting at Pringle Falls, Ore. Horace Cheney, Oregon State College soils department head wields the shovel while S. P. Gessel, University of Washington (kneeling) looks on. From left to right, standing: Bernard Duberow, Deschutes Research Center; Tom Jackson, O. S. C. Soils scientist; Dick Mathews, Atkins Kroll; Carl Berntsen, Deschutes Research Center; Dwight Didzun, Harrisons & Crosfield; Trevor Steele, American Potash and Chemical Corp.

NE WEED CONTROL MEETING TO FEATURE NEW HERBICIDES

"New Herbicides From Industry" will be unveiled at the 14th annual Northeastern Weed Control Conference to be held January 6, 7 and 8 at the Hotel New Yorker, New York City. This session will be held at 8 p.m. on the first day. Companies with something new to present are urged to contact Dr. Charles L. Hovey, Eastern States Farmers Exchange, West Springfield, Mass.

Other advance information about the first day's Conference activities released by the public relations committee—headed by Dr. M. G. Wiltse, The Dow Chemical Co.—lists a discussion of "Developments with Granular Herbicides and Equipment for Their Application" by Dr. L. L. Danielson of the USDA. "Promising New Chemicals for Weed Control" will be discussed by Dr. M. W. Meadows of the Grange League Federation, Inc., Ithaca, New York.

Methods for improving public acceptance of the use of herbicides will be outlined by Dr. Roger Latham, outdoor writer for the Pittsburgh Press, Pittsburgh, Pa. and formerly director of research for the Pennsylvania Game Commission.

Subject matter chairmen for the 1960 Conference are: Horticulture —Oscar E. Schubert, West Virginia University, Morgantown; Agronomic Crops—Robert C. Wakefield, University of Rhode Island, Kingston; Industrial Problems—Clarence E. Staples, Central Maine Power Co., Augusta, Maine; Aquatics—Roy R. Younger, Halco Chemical Co., 13 Phyliss Road, Freehold, N. J.; Public Health—Maurice S. Bowen, 975 Belle Ave., Teaneck, N. J.; Highway Problems —E. E. Turner, Virginia Dept. of Highways, Richmond; Conservation and Forestry—W. E. McQuilkin, N. E. Forest Experiment Station, Upper Darby, Pa.

FAR WEST FERTILIZER SAFETY SCHOOL DRAWS 50 STUDENTS

Fertilizer industry management and local dealers must increasingly recognize the importance of good public relations as well as good safety practices in their areas of local operation. This opinion predominated at the recent Far West Safety School for Accident Prevention at Fresno, attended by some 50 students from the Far Western states.

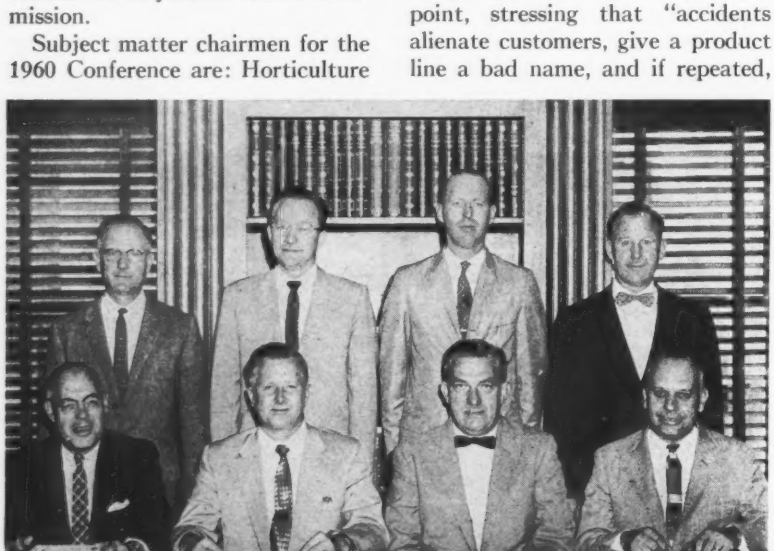
L. M. Roberts general manager, Ammonia Div., Shell Chemical Corp., gave management's viewpoint, stressing that "accidents alienate customers, give a product line a bad name, and if repeated, bring unnecessarily burdensome regulations upon the industry." Outlining the importance of safety training to local fertilizer dealers, H. S. Taylor of Agriform of California said "I feel that fertilizer dealers should create an atmosphere of safety among personnel to the extent that the population near their operations need never feel apprehensive."

The two-day school was sponsored jointly by the Fertilizer Section of the National Safety Council and the National Plant Food Institute. William C. Creel, national chairman of the Council's Fertilizer Section, spoke on "Discovering Accident Hazards."

The fact that the fertilizer industry feels a moral obligation to keep the people working with chemical fertilizers well informed of the products was further brought out in a panel discussion on "Fertilizer Safety Practices for Dealers and Users" moderated by Austin Cline, Shell Chemical Co. Among those participating on the panel was Sidney H. Bierly, general manager of the California Fertilizer Association.

John E. Smith, director of safety, Spencer Chemical Co., was featured twice at the school, speaking on the plant supervisor's job in teaching safety. He showed the film "Teaching Safety on the Job" to illustrate his topic. Other industry representatives appearing on the two-day program were Dr. Guy MacLeod, Sunland Industries, banquet speaker; Jack Sturgess, Collier Carbon and Chemical Corp. who outlined Collier's safety program; G. Willis Madsen, U. S. Steel Corp., who spoke on safety attitudes.

Orm J. Chinnock, Hercules Powder Co., acted as school director, and Dr. Richard B. Bahme, NPFI western regional director, cooperated in working up program arrangements.



Northeastern Weed Control Conference officers and committee chairmen. Seated, left to right: Dr. L. G. Utter, Diamond Alkali Co., president; Dr. D. A. Schallock, Rutgers University, secretary-treasurer; Dr. E. M. Rahn, University of Delaware, vice president; C. T. Noll, Pennsylvania State University, coordinating committee chairman. Standing, left to right: Dr. W. E. Chappell, Virginia Polytechnic Institute, program chairman; Dr. M. G. Wiltse, The Dow Chemical Co., chairman, public relations committee; A. B. Lindquist, Stauffer Chemical Co., sustaining membership chairman; and Dr. S. N. Fertig, Cornell University, awards committee chairman.

MCA PUBLISHES 4TH EDITION OF INDUSTRY FACTS BOOK

A Fourth Edition of the *Chemical Industry Facts Book* was published October 15 by the Manufacturing Chemists' Association.

Single copy price is $1.25. Address MCA at 1825 Connecticut Avenue, N. W., Washington 9, D. C.

People

American Agricultural Chemical Co. K. R. Hedrick has been named production superintendent at Agrico's manufacturing plant at East St. Louis, Ill., according to an announcement by D. S. Parham, vice president in charge of production. D. S. Kirk replaces Hedrick as production superintendent at Danville, Ill.


Tavener

William B. Tavener has joined the Agronomic Service Div. as turf and garden agronomist. He will direct field service activities for the company's Turf and Garden Dept., headquartering in the New York City office.

American Potash & Chemical Corp. Robert P. Rice, formerly chief chemist at the Henderson, Nev., plant, has been transferred to the firm's Los Angeles sales office where he will provide technical sales service to the company's ammonium perchlorate customers.

Atlas Powder Co. Appointment of Arthur N. Green and Paul E. Stubbe as industry marketing assistants in the Chemical Sales Dept. has been announced.

Canadian Industries Limited. L. V. Clegg has been named general purchasing agent, succeeding J. D. Wright, who becomes general manager of the Chemicals Div. Clegg, who joined C-I-L in 1930 as a chemist, has been works manager of the fertilizer plant at Hamilton and production manager of the Agricultural Chemicals Div.


Clegg

California Spray-Chemical Corp. William B. Saylor Jr. has been named branch manager, merchandising sales, responsible for all home and garden sales in northern California, Nevada and Hawaii; James B. Stichka becomes plant superintendent of the Richmond fertilizer manufacturing operation; Robert Edward Chandler has been named production specialist in the Advertising Dept. and Duncan Hayes Pierce becomes advertising technician.

Chemagro Corp. Three new officers have been elected by the board: Charles V. Jones, treasurer; Allan R. Bennett, assistant treasurer; and Robert W. Dammann, secretary.


Jones


Bennett

Calendar

Dec. 1-2. Carolinas-Virginia Pesticide Formulators Association Annual Meeting, Carolina Hotel Pinehurst, N. C.

Dec. 2-3. Indiana Fertilizer Conference, Memorial Center, Purdue University, Lafayette, Ind.

Dec. 2-3. Missouri State Fertilizer Conference, Columbia, Mo.

Dec. 7-8. Annual Soil and Fertilizer Short Course, University of Minnesota soils department, campus of the Institute of Agriculture in St. Paul.

Dec. 7-9. Chemical Specialties Manufacturers Association Annual Meeting, Mayflower Hotel, Washington, D. C.

Dec. 7-10. Western Canadian & North Central Weed Control Conference, Royal Alexandra Hotel, Winnipeg, Manitoba.

Dec. 7-11. "Using Anhydrous Ammonia in Nebraska" dealer workshops. Dec. 7—Lincoln; Dec. 8—Hastings; Dec. 9—Ogallala; Dec. 10—Kearney; and Dec. 11—Columbus.

Dec. 9-11. District Fertilizer Dealer-County Agent Training Schools. Dec. 9—Chanute; Dec. 10—El Dorado; Dec. 11—Wichita Kansas.

Dec. 9-11. International Crop Protection and Pest Control Exhibition, Seymour Hall, St. Marleybone, London, England.

Dec. 10. Iowa Fertilizer Promotion Workshop, Savery Hotel, Des Moines. Sponsored by National Plant Food Institute for member company salesmen and dealers.

Dec. 10-11. Michigan State University Fertilizer Conference, Kellogg Center, East Lansing.

Dec. 11. Ohio Fertilizer and Lime Conference Ohio Union, Ohio State University, Columbus.

Dec. 10. Arkansas Plant Food Conference, Lafayette Hotel, Little Rock.

Jan. 6-8. Fourteenth Annual Northeastern Weed Control Conference, Hotel New Yorker, New York City.

Jan. 7-8. Sixth annual Mississippi Insect Control Conference, Mississippi State University, Alumni-Student Building, State College, Miss.

Jan. 12-13. Nebraska Fertilizer Institute Annual Convention, Pershing Auditorium, Lincoln, Neb. Sponsored by Institute and Univ. of Nebraska.

Jan. 13. Third Annual New Mexico Agricultural Chemical Conference, New Mexico State University, University Park.

Jan. 13-15. Agricultural Ammonia Institute Ninth Annual Convention, Statler Hilton Hotel, Dallas Tex.

Jan. 14-16. Agricultural Aircraft Association Tenth Annual Convention, El Mirador Hotel, Palm Springs, Calif.

Jan. 20-21. Third Annual Arizona Fertilizer Conference, University of Arizona Campus, Tucson.

Jan. 20-21. Northwest Agricultural Chemicals Industry Conference, Benson Hotel, Portland Ore.

Jan. 20-22. Thirteenth Annual Southern Weed Conference, Vista Hotel, Biloxi, Miss.

Jan. 25. Annual Lime and Fertilizer Day, University of Wis., Madison.

Jan. 25-26. Pesticide Conference, Memorial Center, Purdue University, Lafayette, Ind.

Jan. 25-28. Plant Maintenance & Engineering Show and Conference, Convention Hall, Phila., Penna.

Jan. 26-27. South Dakota Fertilizer Dealers Program, South Dakota State College, College Station, S. D.

Jan. 27-28. Illinois Custom Spray Operators' School, Urbana.

Jan. 27-29. The Tennessee Valley Authority and The Southern Regional Soil Research Committee Symposium on the Chemistry of Phosphate-Soil Reactions, Muscle Shoals, Ala.

Jan. 28-29. Annual Meeting of the Colorado Agricultural Chemicals Association, Cosmopolitan Hotel, Denver, Colo.

Feb. 8-9. Meeting of the Southwestern Branch, Entomological Society of America, Hilton Hotel, El Paso, Tex.

Feb. 11-12. Midwest Agronomist-Fertilizer Industry Meeting, sponsored by NPFI, Edgewater Beach Hotel, Chicago.

Feb. 17-18. Alabama Pest Control Conference, sponsored by Ala. Assn. for Control of Economic Pests and the A.P.I. Agricultural Experiment Station, A.P.I. Campus, Auburn.

Dammann

Hunt

Jones has been assistant treasurer since 1957, Bennett has served as fiscal forecaster in the Accounting Div. and Dammann, supervisor of plant personnel and services.

Columbia-Southern Chemical Corp. Arthur H. Gillespie, who had been with C-S and Pittsburgh Plate Glass Co. for more than a half-century, died on October 20 at Pontiac, Mich.

The Dow Chemical Co. Election of Donald K. Ballman and C. B. Branch as vice presidents has been announced by the board of directors. Ballman is director of sales and Branch is manager of overseas operations. The board also elected Robert B. Bennett company treasurer and Fred H. Brown to the new post of company controller.

Georgia Fertilizer Co. Ray L. King, right, president and general manager of the Valdosta, Ga. com-

pany, was honored at the recent Southeastern Fertilizer Conference in Atlanta. He was presented a scroll, authorized by the board of directors of the National Plant Food Institute, in recognition of his leadership and contributions in the field of agriculture, to the fertilizer industry, and to NPFI. Presentation was made by Dr. Russell Coleman, at left.

Geigy Agricultural Chemicals, Div. of Geigy Chemical Corp. Dr. Charles R. Hunt has joined the company's Research Dept. as technical field representative in Montana, North and South Dakota, Wyoming, Minnesota, Iowa, Nebraska, Kansas and Colorado. Dr. Hunt was assistant entomologist at the Montana Experiment Station and technical representative for the Agricultural Chemical Development Section of Du Pont Co. before going to Geigy.

Hooker Chemical Corp. Roger C. Sonnemann has been appointed director of industrial relations for Hooker and its subsidiaries. Arthur P. Schulze, formerly with Diamond Alkali Co., has joined the public relations department.

International Minerals & Chemical Corp., Plant Food Div., has announced promotion of two men: Fred J. Jilek to inventory control coordinator and Henry F. Eizenga to administrative staff assistant. Milek, with IMC since 1942, most recently has been assistant to the division general manager. Eizenga, who joined the firm in 1952, was a division analyst in the Profit Planning Dept.

McConnon & Co. Edward Fleming, 41, sales manager of the direct selling division, died on October 10. He had been with the McConnon organization 13 years.

Monsanto Chemical Co., Inorganic Chemicals Div. Several changes in the farm chemical sales organization have been announced: Stewart D. Daniels becomes product manager, nitrogen chemicals; John S. Moore Jr. has been named product supervisor of ammonium nitrate and urea; Ben W. Martin, product supervisor of anhydrous ammonia, nitrogen solutions and nitric acid; John C. Docter, customer service manager for agricultural chemicals; W. R. Bone technical service manager for agricultural chemicals. All will headquarter in St. Louis.

Joseph W. Tripp, who has been a member of the agricultural chemicals sales group at St. Louis, joins the Los Angeles district sales office, and Roger L. Weinheimer goes to Denver.

National Potash Co. Thomas G. Ferguson has been elected president and chief executive officer of National Potash Co. The announcement was made by Richard C. Wells, former president, who was elected chairman of the board. Ferguson joined NP as vice president and general manager when the company was formed in 1955. He has been in charge of the development of the company's mine and refinery 32 miles east of Carlsbad, N. M. In his new capacity Ferguson will continue to make his headquarters in Carlsbad.

Ferguson

Panogen Co. Dr. Raymond Seven, former technical director, has been appointed assistant general manager. He will be in direct charge of sales administration and also will continue to be responsible for technical development of products within the country.

The Quaker Oats Co., Chemical Div. Robert W. Reardon is promoted to central regional sales manager, with headquarters in Cleveland. Reardon joined Quaker in 1953 as a technical sales trainee. A year later, he was named technical sales representative in the Cleveland area, a position he held until his recent appointment.

Reardon

Smith-Douglass Co. Carl G. Prendergast has been appointed assistant general traffic manager. Before joining S-D in 1957 he was employed in the Virginian Railway traffic department.

Southern States Phosphate & Fertilizer Co. has appointed John A. Carpenter to their sales staff. He will work directly out of their Savannah, Ga. sales office. Carpenter had been with Virginia-Carolina Chemical Co., working out of Rome, Ga.

Carpenter

Tri-State Chemical Co. Elmer Dorsey Young, former vice president and general manager of Tri-State, died at the age of 60 at his home in Louisville, Ky., Oct. 22. Before organizing Tri-State Chemical Co. he was in the sales department of North American Fertilizer Co.

U. S. Industrial Chemicals Co., Div. of National Distillers and Chemical Corp. John A. Putnam has been appointed manager of the Atlanta office. Since 1952 he has been a salesman operating out of the USI New Orleans Sales Div. and has been located in Atlanta for the past two years.

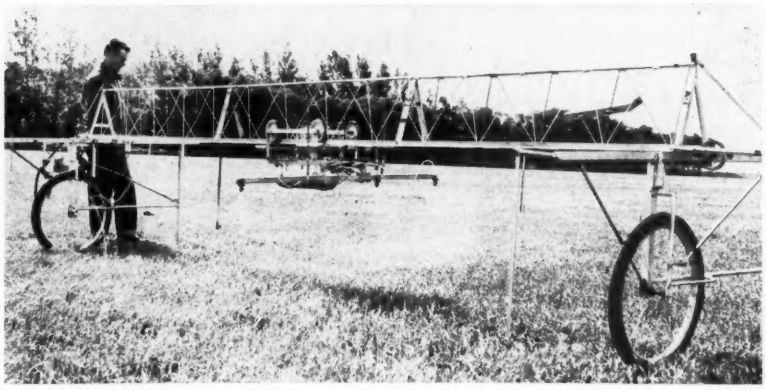
Putnam

Chemicals

SPENCER ANNOUNCES WILD OAT HERBICIDE

Results of an extensive research and development program for a selective herbicide to control wild oats have been reported by Spencer Chemical Co.

Tradenamed Carbyne, the herbicide is said to have shown definite control of wild oats in a number of crops grown in the north-central states and prairie provinces of Canada. One of the major weed pests in these areas, wild oats (Avena Fatua) has heretofore been uncontrollable by chemical methods. Spencer is seeking registration of the new chemical and plans to market it on a controlled basis next spring.



This sprayer was specially designed and built by Spencer for use in its Carbyne testing program this summer. In operation, the spraying apparatus travels along a track at a speed preselected to apply the desired amount in testing various combinations of rate per acre and spray volume per acre. The sprayers are large enough to cover an entire test plot in a single sweep. Under most conditions side curtains were attached to the sprayers to prevent drift.

A post-emergence herbicide, Carbyne in solution is applied as a spray when the wild oat plant is in the 1¼ to 2¼ leaf stage (about 6 to 9 days after emergence). Generally, experiments indicate, ½ pound per acre is the satisfactory rate.

In the field testing program, five test locations, two in North Dakota and three in Canada, made up a total of more than 8,000 separate test plots on which the chemical was tested under a wide variety of conditions on wheat, flax and barley.

In addition, the herbicide was furnished to a number of United States and Canadian experiment stations for testing. These tests, as well as those made by large commercial growers, indicated that, in addition to wheat, flax and barley, Carbyne can be used to control wild oats in sugar beets and canning peas.

In general, the over-all test results indicate that Carbyne, if applied at the proper time and in the proper amount, can be effective in controlling wild oats, Spencer said. The action of the new herbicide, which has the chemical name of 4-chloro-2-butynyl N-(3-chlorophenyl)carbamate, is to inhibit or kill the wild oat plant, allowing the crop being grown to develop without severe competition. Field tests this past summer supported laboratory findings that, for maximum effectiveness, spraying must be done when the wild oat is at the proper leaf stage (usually 1¼ to 2½ leaves).

Toxological and residue studies have shown that Carbyne will pose no serious handling or soil residue problems.

'PERFECT ACRE' PLOTS ESTABLISHED IN WASH.

Quincy Valley fertilizer dealers, in cooperation with the Grant County Extension Service and National Plant Food Institute, recently put out some high fertility plots on selected alfalfa fields in the area. Purpose of the experiments was to make sure that plant food was not a limiting factor in plant growth.

About $70 worth of fertilizer per acre was applied in one heavy shot. Amount of plant food elements applied per acre was: 500 pounds phosphate, 250 pounds potash, 13 pounds zinc, 48 pounds magnesium, 5 pounds boron, 128 pounds sulfur and 6 pounds of iron. "The amount of fertilizer applied should last for

Heavy shot of fertilizer applied by bulk spreading truck to alfalfa fields in Quincy, Wash., area. Inspecting the job from left to right are F. Todd Tremblay, NPFI; Don Barrens, grower; A. T. Romano, Quincy Farm Chemicals; and Lee McFarlane, Pacific Cooperatives.

at least five years," said F. Todd Tremblay, regional director of NPFI.

The ingredients were mixed by Quincy Farm Chemicals and applied by the Pacific Cooperative spreading truck. Other fertilizer dealers in the area also cooperated on the project.

INSECTICIDE EFFECTIVENESS STUDIED ON STORED PEANUTS

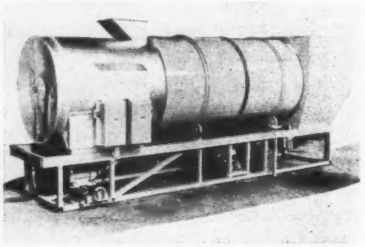
Results of studies on the efficacy of lindane, methoxychlor, synergized pyrethrum and ryania to protect farmers stock peanuts from insect infestation and damage are given in a report issued by USDA.

Marketing researchers in USDA's Agricultural Marketing Service studied the effectiveness of these insecticides when applied to the top surface of piles of bulk peanuts stored in small experimental bins and in a warehouse. They also studied the effectiveness of the insecticides when applied to the entire lot of peanuts as the peanuts were placed in the bins.

A free copy of the report—"In-Storage Treatments for the Protection of Farmers Stock Peanuts From Insect Damage—Exploratory Tests," Marketing Research Report No. 363—may be obtained from the Office of Information, USDA, Washington 25, D. C.

Equipment Supplies

FINCO, INC. INTRODUCES NEW DRYER



A new drier introduced by Finco, Inc., is used to remove moisture from farm crops, fertilizers, chemicals, charcoal, seed, feed, pellets and other products, Finco says. The heat source can be either electrical or steam heat, depending upon availability or choice.

Variable air flow volume from 4,000 to 30,000 CFM, combined with variable speed control of the revolving cylinder, permits the unit to be specially set to handle a wide range of capacities and materials.

For details,
CIRCLE 378 ON SERVICE CARD

CLOSING SEWN BAGS WITH POLYETHYLENE COATED TAPE

Now, in-plant closure of sewn bags with polyethylene-coated tape is possible through use of a new bag sealer, the Crown Thermo-Tape machine, reports Crown Zellerbach Corp.

The machine fits into the production line in synchronization with the sewing machine. The filled multiwall bag moves into the sewing machine and then passes through the Thermo-Tape machine with no assistance, the manufacturer says.

For further information, simply
CIRCLE 379 ON SERVICE CARD

NEW UNIT GROWS GREEN GRASS THE YEAR ROUND

Production of a completely equipped weatherproof unit for growing fresh green grass the year around under controlled conditions without the use of soil has been announced by Hydroponics, Inc.

Called the "Green Feeds" unit, it is designed to provide livestock producers and dairymen with fresh green feed throughout the year, at a cost of about $8 to $10 a ton. The units produce 400 to 500 pounds of grass daily from 50 pounds of any sproutable cereal grain.

POLYSULFIDE-EPOXY COATINGS SOLVE PROBLEM ON RR CARS

A coating made of polysulfide liquid polymer and epoxy resin has solved a maintenance problem for fertilizer and chemical-carrying railroad hopper cars, according to Thiokol Chemical Corp. The firm says the coating not only provides protection against corrsoion for the steel cars, but also withstands the abrasive action of dry chemicals and fertilizers.

After three years service, carrying muriate of potash, the coating is reported to be in excellent condition.

North American Car Corp. has coated 100 additional cars with Thiopox, a commercial polysulfide-epoxy coating supplied by Phelan Faust Paint Mfg. Co. It is expected that the cars will be in service for at least five years without need of additional coating or painting.

PATENT REVIEWS

By Dr. Melvin Nord

FERTILIZERS

U. S. 2,891,856, issued June 23, 1959 to John G. Getsinger and Robert L. Haunschild, assigned in part to Tennessee Valley Authority describes a process for the manufacture of fertilizer from wet-process phosphoric acid and ammonia. It provides improvements in the removal of impurities containing iron, aluminum, and calcium.

U. S. 2,893,858, issued July 7, 1959 to Robert A. MacDonald and Thomas H. Stewart, assigned to International Minerals & Chemical Corp., describes a process of granulating fertilizers.

Solid fertilizer components consisting primarily of phosphate and potash constituents are mixed. An aqueous nitrogenous solution of urea and ammonia is then added, along with an equivalent amount of aqueous sulfuric acid solution. The moisture content of the mixing solids is maintained at 2–15%.

The material discharged remains substantially as wetted particles and crumbly aggregates of particles. It is then heated while tumbling in a drying atmosphere. Substantially all the urea constituent is retained in the final product, without hydrolysis.

PESTICIDES

U. S. 2,889,243, issued June 2, 1959 to Gerald E. Underwood and Samuel J. Musser, and assigned to The Upjohn Co., discloses the use as a virucide of hydroxypyruvaldehyde ethers.

U. S. 2,890,960, issued June 16, 1959 to Vladimir Dvorkovitz and Ivan C. Brooks, assigned to The Diversey Corp., discloses a method of preventing the laying of eggs by fruit flies on foodstuffs such as fruits and vegetables, by the use of antienzymes.

U. S. 2,891,887, issued June 23, 1959 to Everett E. Gilbert, assigned to Allied Chemical Corp., discloses the use, as pesticides for combatting insects and mites, of dialkyl 1,3-di (carbalkoxy)-1-propen-2-yl phosphate.

U. S. 2,891,888, issued June 23, 1959 to Howard R. Guest and Harry A. Stansbury, Jr., and U. S. 2,891,889 issued on the same date to Harry L. Haynes, each assigned to Union Carbide Corp., disclose the insecticidal properties of 3-(2-cyclopentenyl)-2-methyl-4-oxo-2 cyclopentenyl chrysanthemumate. This ester, which is called cyclethrin, may be used to protect food products such as wheat and corn from insect attack.

PLANT GROWTH REGULANTS

U. S. 2,891,854, issued June 23, 1959 to Harry Kroll and Joseph Antognini, assigned to Geigy Chemical Corp., discloses the use of ferric chelate of diethylenetriamine pentaacetic acid for correcting iron deficiencies in growing plants.

The iron-DTPA chelate is as effective as the known iron-EDTA Chelate in remedying the chlorosis in iron deficient plants grown on acidic soils, but is much more effective in alkaline soils and is much less toxic to the treated plant.

U. S. 2,892,696, issued June 30, 1959 to Keith C. Barrons and assigned to The Dow Chemical Co., describes a method of suppressing the growth of emergent seeds and emerging seedlings of many undesirable seed species, utilizing 2,2,3—trichloropropionitrile.

HERBICIDES

U. S. 2,889,347, issued June 2, 1959 to Arthur Schwerdle, describes a method for making alkali metal methyl arsonates which are in a form suitable for use as herbicides.

Sodium or potassium arsenite is methylated with dimethyl sulphate in the presence of sodium or potassium hydroxide.

U. S. 2,891,855, issued June 23, 1959 to Hans Gysin and Enrico Knusli, assigned to J. R. Geigy A. G., discloses the use of certain diamino-chloro-s-triazines as herbicides.

U. S. 2,893,855, issued July 7, 1959 to Allen E. Smith and Albert W. Feldman, assigned to United States Rubber Co., discloses the herbicidal properties of N-1-na-hp thylmonochlorophthalamic acid.

U. S. 2,891,855, issued June 23, 1959 to Hans Gysin and Enrico Knusli, assigned to J. R. Geigy A. G., discloses the herbicidal activity of certain diaminochloro-s-triazines.

U. S. 2,893,856, issued July 7, 1959 to Philip C. Hamm, assigned to Monsanto Chemical Co., discloses a method of defoliating plants, utilizing ethyl p-anisylthionocarbamate, ethyl p-phenetylthionocarbamate, or similar compounds.

SOIL CONDITIONING

U. S. 2,898,320, issued Aug. 4, 1959 to George S. Sprague and Henry Z. Friedlander, assigned to American Cyanamid Co., discloses a method for conditioning soil with a polymer containing N-methylol amide substituents on the carbon chain.

PEST REPORTS

*By Kelvin Dorward**

THE SPOTTED ALFALFA APHID, which was of very little concern throughout most of the summer, was becoming a problem in some areas by October. The heaviest buildup of the insect since 1956 was recorded in central and southeastern Arizona. Honey dew deposits and feeding damage were heavy in fields, especially on susceptible alfalfa varieties. Populations in many fields built back following one application of insecticide and the second application appeared to be necessary in some instances. Populations of the spotted alfalfa aphid were becoming heavy in many Dona Ana county, New Mexico, fields by the latter part of October. Most of the seedling alfalfa in the county was treated.

The first record of the spotted alfalfa aphid for the year in Washington State was in early October. Distribution was almost identical with that of 1958 being found along the Columbia River from Whitcomb to Plymouth, in the Kennewick and Burbank areas, around Benton City and Prosser, in Walla Walla county near Gardens and near Asotin along the Snake River. In Oregon the aphid was still on the increase around Hermiston, with damage apparent. The insect was found October 6 near Stanfield where it was absent 10 days previous.

Light infestations of the spotted alfalfa aphid were found in the Loyalton, Sierra county, California, area in October. This is the first record for the county. Other states reporting light infestations of the aphid during October included Utah, Colorado, Texas, Oklahoma, Kansas, and Missouri.

Results of a survey conducted in September indicate the probability of severe attacks of the ***meadow spittlebug*** in parts of Ohio in the spring of 1960. Adult populations found during the 1959 fall survey indicate that the central and southwestern areas of Ohio can expect severe damage to forage crops in 1960 unless control measures are undertaken. Populations found in the northwestern and extreme southern areas were very low and damage is not expected next year. In other sections of the state damage can be expected in some fields, but it will not be widespread.

The annual spittlebug survey in forage in West Virginia was conducted in 15 counties. The state average was very low being only 1.43 adults per 100 sweeps. As a comparison, the average in central Ohio was in excess of 600 adults per 100 sweeps.

As of October 17, 1,336 acres in Maricopa, Pinal, and Graham counties, Arizona, had been found infested with ***pink bollworm*** larvae or showing definite evidence of damage. Larvae were collected in fields involving some 600 acres and from gin trash or lint cleaners representing over 350 acres. Definite evidence of damage had been found on acreage slightly in excess of 350 acres. Populations in most instances were light. The infested acreage was greatest in Graham county in fields not under the 1959 eradication program. As a matter of fact only 2 instances of infestation persisting despite the cultural and insecticidal program have been found as of late October.

Inspections of lint cleaners and gin trash indicate that populations of the pink bollworm are considerably lower throughout Oklahoma than in 1958 to the same time. Gin trash inspections in Texas showed that infestations were lighter in most counties than in previous years. In Louisiana gin trash inpections during September were negative for the first time in several years in the southern part of the infested area. However, larvae were found in gin trash in Caddo, Claiborne, DeSoto and Lincoln parishes in northern Louisiana. Pink bollworm was found for the first time in Cleveland county, Arkansas, during September.

During the summer of 1959 there was a serious outbreak of a ***pine sawfly*** in the pines of North Carolina, Virginia and Maryland. A recent survey by the U. S. Forest Service and cooperating states showed the defoliation caused by the insect to be rather widespread. The estimated acreages of pine defoliation, which ranged from light to complete, was 42,000 in North Carolina, 2,094,000 in Virginia, and 192,000 in Maryland.

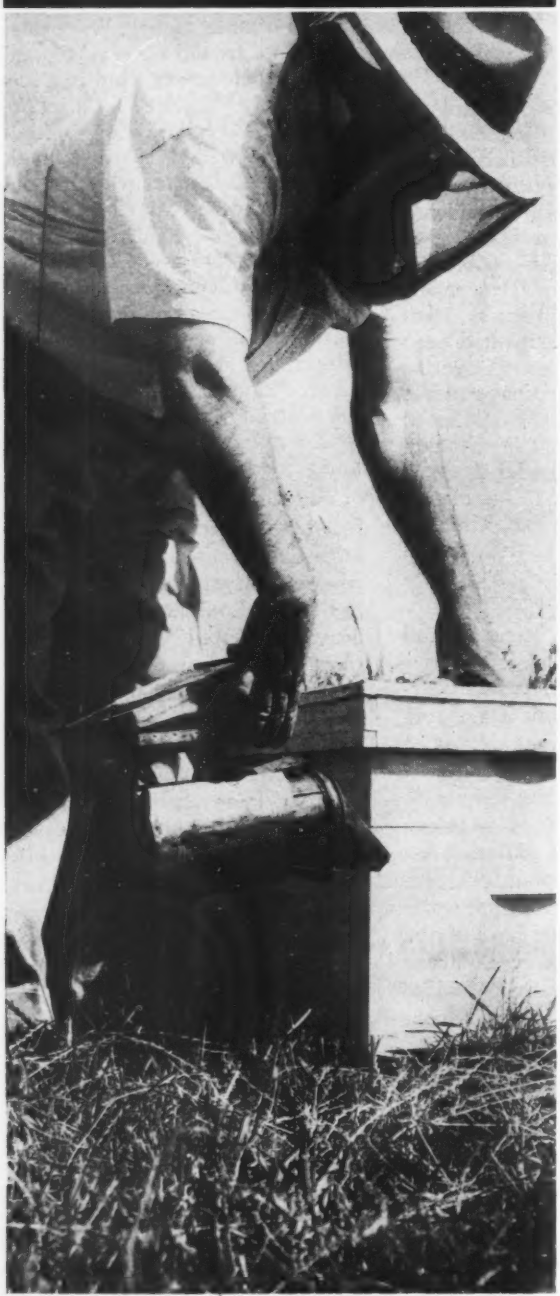
In Marinette county, Wisconsin, aerial and ground surveys showed about 10,000 acres of pin oak forests heavily defoliated by a ***walkingstick.*** Defoliation on another 1,200 acres was classified as moderate. ***Bark beetles*** were responsible for causing partial and complete kills of ponderosa pines, singly and in groups of 2–5 trees in about 10,000 acres of trees in Miami and Bass Lake areas of the Sierra National Forest, California. The infestations were associated with earlier heavy snow breakage. In the generally infested area, broken tops were treated during the spring along roadways.

The ***cabbage looper*** in early October was serious enough on collards in sections of Baltimore county, Maryland, to require treatment. In Louisiana cabbage was heavily infested by the insect throughout the state, and in New Mexico it continued to be a problem in Dona Ana county lettuce fields. Late green beans in Sussex county, Delaware, and in Erie county, Pennsylvania, were reported damaged by the European corn borer. Second to fourth-instar larvae were very abundant and causing severe injury to pepper pods and plant stalks in untreated pepper fields throughout Delaware. Infestations were also reported on peppers in Lawrence, Beaver, and Mercer counties, Pennsylvania.

The ***screw-worm*** eradication program, which has been conducted in Florida and the southeastern states during the past two years, has now been brought to an apparent successful close. No screwworms have been taken in Florida since June 17. The plant used in the production of sterile flies was closed in early November. ▲

*Chief Staff Officer, Survey & Detection Operations, Plant Pest Control Div., Agricultural Research Service, USDA.

Bees' Lullaby



A beekeeper gets ready to smoke his bees with ammonium nitrate pellets to put them to sleep.

A novel use for ammonium nitrate: Putting bees to sleep. Smoking bees with AN results in lapse of memory. When they revive, bees must re-orient themselves.

By A. B. KENNERLY

BEEKEEPERS are finding a new and strange use for ammonium nitrate pellets. They use them to put their bees to sleep. It's not that the bees are bothered with insomnia. Beekeepers use the fertilizer to manipulate their bees by putting some of the chemical in the bee smokers and giving the hive a good smoking.

"I use the pellets to make the bees continue working a field where I want them to be," says T. E. Kane who operates 1,800 colonies near Hallettsville in South Texas. "Once in a while, they leave a field where they're gathering high quality clover honey and wander off to horsemint or some other source of low quality honey. It's then that I wrap a few pellets of ammonium nitrate in burlap and put them in the smoker. Smoking bees with this chemical causes them to have a lapse of memory, and when they revive, they must re-orient themselves."

This sort of bee manipulation plays upon an old law of nature of bees. When bees are moved in their hive to a new location, they rise above the hive in their flight to circle a few times, then make a bee-line for the nearest field that is giving a honey flow. This is called re-orienting themselves.

Now, if the hive is moved only a short distance, bees do not re-orient themselves, and as a result they may come back to the old location never finding the new. They buzz in circles until they drop dead.

What the ammonium nitrate seems to do, according to Claud Burgin, bee authority at Texas A. & M. College, is to put the bees in the same state of condition as moving the colony a long distance, forcing them to re-orient themselves.

Beekeepers are making several uses of the chemical smoke. When they move the bees a short distance they may use the chemical to be sure they re-orient themselves before leaving their home and are able to return to the new location.

Kane uses the method when his bees may become a nuisance around cattle fed a mixture containing molasses. The bees can be put to sleep and it will take several days or even weeks before they locate the source of molasses again.

Perhaps the beekeeper has rented his colonies to a seed producer for pollinating his crop. Bees do not always take a personal interest in such contracts and may decide to render their services at a more distant site. Bees travel as far as five miles for their stores of honey, water and pollen. In such a situation, the beekeeper can put his little darlings to sleep, and when they awake, they will return dutifully to the clover field where they're supposed to be working.

There seems to be a big future in bees' sleeping powders. ▲

SUCCESSFUL MEETINGS

(Continued from page 25)

with growers and dealers," Dr. Bahme reported, "from which we could obtain actual measurements of success by increased sales of specific agricultural chemical products. Our ingredients for successful meetings were as follows:

1) Work through an enthusiastic and cooperative local dealer.
2) Restrict the scope of the meeting to one or two crops or problems. Be sure to feature, if possible, a new angle to capture interest.
3) Schedule the meeting about three to four weeks in advance of the time of action, or in the non-busy season for the crop as close to time of use as possible. This is particularly appropriate for deciduous fruit and nut crops.
4) Obtain grower interest by glamorizing and dramatizing the importance of the meeting topic in terms of *grower benefits*.
5) Hold the meeting in the early evening at a local community meeting place.
6) Make every effort to coordinate the program with university specialists, local county agents, soil conservation service technicians, vo-ag instructors, agricultural commissioners, grower association field men, agricultural specialists from local banks. Invite them to the meeting and be sure to properly introduce those who may not directly participate in the program.
7) Start advance publicity on the meeting about three to four weeks ahead via direct mailings to selected growers. Obtain their names from dealers and grower associations. Follow through with local newspaper and radio publicity one to two weeks prior to the meeting. If local radio station has farm program, make sure your publicity will be featured on same.
8) The local dealer or salesman should have at least one or two outstanding growers who have had successful experiences with the use of the product(s) to be discussed at the meeting. They should have a place on the meeting program.
9) Draw upon outstanding technical personnel of basic suppliers who have first hand knowledge of grower problems and can talk in grower language.
10) Make every possible use of visual aids, particularly those locally adapted (don't show a film that isn't); present simple and clear data, results and recommendations; emphasize economic benefits; avoid price discussions.
11) Keep the meeting short—one and one-half to two hours. Allow one-half hour for discussion, questions and answers. Provide coffee, doughnuts and soft drinks at the end of each meeting. The best meetings are sometimes the smallest with only a dozen or so growers. Since they have come of their own free will, they are likely to be good sales prospects. Be sure to have a sign up list."

The payoff comes from following through with the growers who attended the meeting as soon after the meeting as possible, as George Simons' experience proved quite conclusively. You'll never have better timing for getting the order! ▲

TECHNICAL REVIEW

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PART II. Among reports presented at the Symposium, "Research Progress on Insec Resistance," October 7-8 at the Mayflower Hotel, Washington, D. C. were these.

More than 200 people attend the symposium, sponsored by a committee of the National Agricultural Chemicals Assn. and the Entomological Society of America.

Genetical Studies on Insecticide Resistant Insects, by R. Milani, University of Pavia, Italy. Information on inheritance extends now to *A. gambiae, A. sundaicus, Aë. aegypti, Lucilia cuprina,* and to new strains of house-fly, of drosophila and of the German roach. The recent findings include cases of simple inheritance, of polyfactoriality and a case of slight maternal effect. In agreement with previous findings, field developed resistance seems to exploit properties inherited as a unit (simple inheritance), and laboratory selection seems to favor genetically complex properties. The bulk of information so far available refers to chlorinated hydrobarbons; however, cases of resistance to nicotine sulfate, phenylthiourea (PTU), phenylurea (PU), and organo-phosphorus insecticides have been genetically studied. In the house-fly two non-allelic genes for DDT-resistance have been located to the same linkage group; the same experiments have provided evidences for a sex-limited enhancer of dominance for resistance and for modifiers with slight effect.

Research in genetical fields other than inheritance has been less extensive, but very informative. The preadaptive nature of resistance which was generally accepted on the basis of indirect evidences and of theoretical considerations, has been directly proved both through laboratory experiments of selection *without* intoxication (sib-selection, Bennet 1958) and through the study of field populations (*A. gambiae*, Davidson 1958). The field work on *A. gambiae*, provides perhaps the most extensive information on population genetics of resistance, a field otherwise almost ignored, in spite of its utmost importance.

Attempts to study the inheritance of the defense mechanism rather than 'resistance' have provided very encouraging results, and are a real achievement in the field of physiogenetics of resistance (Lovel and Kearns, 1957).

Fairly extensive observations on salivary chromosomes of Anopheles have generally shown a higher frequency of inversions among resistance selected strains in comparison with the original susceptible ones; similar findings are on record for experiments of breeding under abnormal conditions, and so further studies are required to decide the real bearing of these findings on the resistance problems.

Cross-resistance and the relations between different types of resistance in pest insects have not been submitted to genetical analysis; in *D. melanogaster* it has been shown that a locus on Cr.II° controls resistance to DDT, BHC, parathion, PU as well as high susceptibility to PTU; whereas a locus on Cr.III° controls resistance to nicotine, PU and PTU.

All experiments on mutagenic effect of insecticides have been negative; most of them are based on the use of chlorinated hydrocarbons; perhaps more attention should be given to phosphorus insecticides, which, at least in resistant insects, may alter the balance of P, a basic constituent of nuclear material.

Attempts to recognize morphological or biological traits correlated with resistance have provided contradictory results; increase of fertility after dieldrin treatments has repeatedly been observed and has been interpreted as a direct (primary) effect of the toxicant.

Resistance has appeared more frequently among insects of public health interest than among agricultural pests; the genetical systems and the reproductive modalities of the taxonomic groups involved should be considered among the possible causes of that difference.

Insect Resistance to the Carbamate Insecticide, by H. H. Moorefield, Boyce Thompson Institute, Yonkers, New York. The large-scale use of toxicants in preventive and therapeutic medicine, in public health, and in pest control, has frequently led into secondary problems through development of strains of organisms resistant to the compound designed for their eradication. With the introduction of a new class of insecticides, such as the carbamic acid esters, the question of resistance is again certain to recur. The purpose of the present studies was to assess the potential of the insect to tolerate these compounds and to attempt to find a means to avert such an eventuality.

The principal causes for the resistance phenomenon have been shown to be changes within the target mi-

crobe, insect, etc., which may occur spontaneously upon contact or be genetically derived through a continuous process of selecting out the most tolerant individuals in a given population. No evidence has been obtained to indicate that the carbamates can induce an immediate physiological change of susceptibility in any of a group of insect types.

Laboratory-selected strains of house flies have now been maintained for two years under constant pressure from a series of structurally diverse carbamates (phenyl, bicyclic and heterocyclic). These experiments point out that a correlation exists between the slope of the dosage-mortality curve obtained with a specific carbamate and the capacity of the fly to develop a tolerance to that compound. Flies highly susceptible to a particular compound have not demonstrated a greater change in response after continuous, rigorous selection than would be anticipated from variation in vigor tolerance (5-8-fold). Carbamates that are less effective fly toxicants readily produce resistant progeny within a few generations.

The activity of the carbamates can be synergized with the methylenedioxphenyl compounds and other type structures. Enhanced performance in house fly assays can be obtained with carbamates that display all degrees of efficiency of toxicity. Resistance appears to have been suppressed through selection with synergistic combinations. Carbamate selections have also been carried out with the Mexican bean beetle for one year with no resultant resistance.

Current Status of Insecticidal Resistance and Control in Cockroaches, by J. M. Grayson, Virginia Polytechnic Institute, Blacksburg, Virginia. The incidence of resistance to chlordane in the German cockroach has increased since it was first reported in 1951, so that today resistant strains exist over most of the U. S. A. Resistance to dieldrin and lindane is also rather widespread, and some resistance to pyrethrins has been reported. Resistance to malathion has been demonstrated in laboratory-selected strains. Apparently there are no reports of resistance in other species of cockroaches.

Field-evaluation tests conducted in 1955 showed Malrin to be the safest material for satisfactorily controlling resistant German cockroaches, whereas mixtures of malathion and dieldrin gave best results when the American, Oriental, and resistant German cockroaches were all present. In USDA-sponsored, laboratory tests Shell 52-RL-45 and Shell 52-RL-71 had the longest duration of effectiveness against normal strain German cockroaches, but Diazinon was the most effective material in controlling both resistant and non-resistant roaches; whereas chlordane, Shell 52-RL-71, malathion, Bayer L 13/59, Diacinon, and a combination of sodium fluoride and synergized pyrethrum were found effective in control of natural populations of three other species of cockroaches. In NPCA-sponsored tests at V. P. I., designed to determine the residual effectiveness of various materials in control of chlordane-resistant and normal German cockroaches, Dicapthon and Diazinon were found to be very effective materials; however, Diazinon gave poor control on such surfaces as galvanized sheet metal, glass, and linoleum. Promising results were obtained on Masonite panels with Sevin, Korlan, malathion, and Malrin. Similar tests now in progress include DDVP, three formulations of Sevin, Hercules 5727, Dimethoate, American Cyanamid 18,706, Diazinon, and Dibrom.

Formal Genetics of Insecticide Resistant Strains of Insects, by James F. Crow, University of Wisconsin, Madison, Wisconsin. The development of resistance to insecticides can be thought of as an example of very rapid selection, in response to a change in the environment. There is strong evidence that the development of resistance is pre-adaptive rather than post-adaptive; that is, the insecticide acts as a selective agent that favors the survival of resistant genes already in the population, rather than inducing the resistance. Evidence comes from: 1) the failure of non-killing doses to induce inherited resistance, 2) relative ineffectiveness of selection within inbred lines, 3) the development of resistant strains by selection of sibs of resistant flies, so that the direct ancestors of the resistant flies were never exposed to the insecticide, 4) analogy with similar phenomena in other organisms.

The question of whether the process of selection utilizes mainly resistant genes that are already present in low frequency in the population or whether mutants arise during the selection process is, in most cases at least, resolved in favor of the former. This is clearly true for the Drosophila experiments and probably so for others.

The precision of genetic analysis depends on the kind of insect that is being studied. It is clear that most, if not all, of the resistance is chromosomal rather than depending on non-mendalian factors such as cytoplasmic particles. The manner of inheritance in different insects is widely different. In some cases there is strong evidence that a single dominant or recessive gene is responsible; in others it is more complex, and in some strains of Drosophila DDT resistance has been shown to depend on genes on all the major chromosomes. It is as if natural selection utilized whatever kinds of resistance genes happened to be present.

The rate of return to susceptibility when selection is relaxed would be expected to depend somewhat on the manner in which the resistance developed. Polygenic resistance that developed under conditions where considerable natural selection for vigor and fertility was occurring shows very little regression to susceptibility: presumably the resistance factors are nearly neutral otherwise. On the other hand if the resistance factors are otherwise deleterious, they would decrease when selection for insecticide resistance is relaxed.

The existing data appear to conform roughly to this expectation. The rapid response of formerly resistant strains to renewed selection for resistance is readily understood by the fact that the resistance genes have not returned to their initial extremely low frequencies and therefore respond much more readily to selection.

SUSPENSION F

They are possible and entirely practical, according to TVA and industry studies Here

By WILLIAM S. NEWSOM, JR.*

EVEN BEFORE the T.V.A. fertilizer technology demonstration last summer, there was considerable interest in suspension fertilizers. Work began at T.V.A. at least as early as 1955 on the production of ammoniated wet process acid.

The high cost of raw materials for liquid fertilizers is causing manufacturers to look for ways of reducing this cost. The substitution of wet process acid for electric furnace phosphoric acid is one solution to the problem. However, the precipitated impurities that form when wet process acid is neutralized tend to settle. These settled impurities become difficult to disperse if the fertilizer is stored, resulting in a fertilizer that is not uniform. The sediment also can become so dense that the fertilizer cannot be drawn from the storage tank. It was found that a small amount of an inexpensive suspending agent would prevent or delay settling, and that such settling as did occur was of little consequence, since very slight agitation would make the mixture homogeneous. Then, it was found that high salting-out temperatures of a mixture were unimportant, since such crystals that formed remained small and uniformly suspended. This opened up the possibility of the production of fluid fertilizers which were much more concentrated than complete liquid fertilizers. Studies by T.V.A. and private industry have shown that such production is possible and entirely practical.

It is the purpose of this paper to discuss the raw materials, equipment, and production methods that now appear to be suitable.

DEFINITIONS

Suspension fertilizers are fluid fertilizers which contain crystals of fertilizer materials suspended in saturated fertilizer solutions. For the purpose of this paper, they are considered to be nearly neutral and to contain at least two of the three primary nutrients, nitrogen-phosphorus-potassium. Fluid fertilizers which contain precipitated iron and aluminum phosphates as the only suspended solids are termed "suspended impurities fertilizers."

The requirements of suspension fertilizers are, in the simplest terms, that they must be fluid enough to be mixed, pumped, and applied to the soil with no great alterations in manufacturing or application equipment, that they must be homogeneous, or capable of being made homogeneous, and that they must remain homogeneous during application.

ADVANTAGES OF SUSPENSION FERTILIZERS AS COMPARED WITH LIQUID FERTILIZERS

1) Lower Cost Raw Materials

a) The delivered cost of wet process phosphoric acid is usually considerably less than that of electric furnace phosphoric acid.

b) The supplemental nitrogen can be supplied from neutral ammonium nitrate-urea-water solutions in almost all grades, and in some grades, ammonia-ammonium nitrate-water solutions can be used.

2) Higher Analyses are Possible

a) A fertilizer plant can produce about 33% more, in terms of nutrients, by producing suspensions instead of liquids. This is especially important in the spring season when demand exceeds the capacity of the plant.

b) Fluid fertilizers can compete with solids on a concentration basis.

c) The economical market area of a fertilizer plant will be enlarged.

3) Secondary and minor elements can be incorporated in significant quantities, even though they may precipitate in the presence of phosphates.

4) Economical chloride-free fertilizers can be produced by using potassium sulfate as the K_2O source.

DISADVANTAGES OF SUSPENSION FERTILIZERS COMPARED WITH LIQUIDS

1) More skill is required on the part of the operator.
2) Additional capital expenditure is required.
3) The plant is more difficult to keep clean.
4) There may be customer resistance to overcome.

SUITABLE RAW MATERIALS FOR SUSPENSION FERTILIZERS

1) *Wet Process Phosphoric Acid.* This is preferable to electric furnace acid because of the self-suspending properties developed in the mixture by the precipitated iron and aluminum phosphates.
2) *Muriate of Potash.* Flotation (red) or recrystallized (white) are both satisfactory.
3) *Anhydrous or Aqueous Ammonia.* If aqueous am-

* *This article is based on a talk presented by William S. Newsom, Jr., International Minerals and Chemical Corp., Florida Experiment Station, Mulberry, Fla., at the National Fertilizer Solutions Association Convention, held in St. Louis, Mo., November 8-10.*

monia is used, 50% is preferable.

4) *Ammonium Nitrate-Urea-Water Solutions.* The 32% N solution is preferable if temperature permits.
5) *Ammonia-Ammonium Nitrate-Water Solutions.*
6) *Suspending Agents.* Attapulgite clay or Western bentonite is recommended. Non-swelling bentonite (Southern) is not recommended.
7) *Potassium Sulfate.*
8) *Sulfate of Potash-Magnesia* (*Sul-Po-Mag*).
9) *Ammonia-Urea-Water Solutions.*

EQUIPMENT FOR THE DISPERSION OF CLAY SUSPENDING AGENTS

1) Clay dispersion equipment
   a) Mixing tank
   b) High shear apparatus such as:
      (1) Gear-Shear pump, or
      (2) Cowles Dissolver, or
      (3) High Speed Stone Mill
      Each of these pieces of equipment has its advantages and disadvantages.
   c) Storage tank. If a pump is used, the clay may be added to the water in the storage tank, thus eliminating the need for a mixing tank.
2) Optional clay-dispersion equipment—for large-scale suspension fertilizer manufacturing operations.
   a) Gravimetric feeder for dry clay
   b) Jet mixer
   c) Scales or
   d) Clay slurry meter with a positive displacement pump which will not be damaged by abrasion
   e) Water meter
   f) Ammonia meter
3) Mixer. The mixer should have at least a three-horsepower motor. It should have a gear reducer to reduce the speed to about 450 RPM and should have two propellers on the shaft. These should be 10 or preferably 12 inch diameter blades. The mixer should be mounted off-center.
4) Neutralizing tank.
   a) The depth should be equal to or greater than the diameter. The bottom should be conical.
   b) If the ammonia and phosphoric acid cannot be metered-in simultaneously, the tank should be made of 316 stainless steel.
   c) If external cooling is not practical, the tank should be jacketed and cold water passed through the jacket. Cooling coils in the tank are not recommended.
5) Meters. Even with a tank mounted on scales, an ammonia meter is recommended. Other liquid meters are desirable if a high production capacity during peak seasons is required.
   The simultaneous addition of ammonia and phosphoric acid is advantageous.
6) Screens. It is customary to use a screen under the neutralization tank to remove trash. A 24 to 28 (Tyler) mesh stainless steel screen is recommended at this point. If the product is to be stored, the same size screen should be used between the storage tank and the loading point. The next larger size should be used in the application equipment. No screens should be used at the nozzles. The nozzles should be large enough to allow passage of any crystals that pass the screen in the application equipment.

TECHNIQUE AND MIXING ORDER

I. If the plant equipment is arranged so that the acid must be added before the ammonia, the following order is recommended:
   1) Water
   2) Acid
   3) Potash salts
   4) Ammonia
   5) Clay-water slurry
   6) Supplemental nitrogen

   If the mixture tends to thicken too much during mixing, keep stirring and adding ammonia. It will thin down before the ammonia addition is complete. The next time the formulation is made, add the clay-water slurry, and if necessary the urea-ammonium nitrate solution, before ammoniation. Somewhat better suspending power might be obtained from the clay if it is not contacted by acid. Likewise, some hydrolysis of the urea is possible if it is contacted by the acid. I have found no measurable differences in the properties of suspensions made by adding the urea-ammonium nitrate solution before neutralization with those made by adding it after. Neither have I found any differences when the clay slurry is added before or after ammoniation.

II. *Technique and Mixing Order When Ammonia and Acid are Added Simultaneously*
   1) Water
   2) Clay-water slurry
   3) Start ammonia and acid with the ammonia at a slightly faster rate than the acid. The *p*H should be about 8.0 until all the ammonia has

been added. When the acid addition is completed, the *p*H will, of course, drop to around 6.5, or 6.8.

4) Supplemental nitrogen may be metered-in at the same time the ammonia and the acid are being added.
5) As soon as there is enough liquid in the tank to slurry it, add the potash material.

CLAY DISPERSION TECHNIQUE

Particular attention must be given to the dispersion of the clay in the water. A high shearing stress is required to break up the fine agglomerates of clay into their ultimate particles. If the clay is not properly dispersed by powerful beating or by application of other high shearing stress, poor suspension will result. Poor dispersion will also leave lumps in the slurry. These lumps will clog screens.

We have dispersed clay in pilot plant and plant operations very satisfactorily with a gear-shear pump, a Cowles dissolver, and other equipment. Clay cannot be properly dispersed by putting it into the neutralizing tank with water and stirring with the mixer.

Good dispersion of the clay is the key to the production of high-quality suspension fertilizers. We have made two attempts in pilot plant operations and two in plant operations to disperse the clay by recirculating through centrifugal pumps, with the discharge throttled down. Each time, the results were unsatisfactory.

The per cent clay that should be used will depend on several factors:

1) The grade being made.
2) The formulation for this grade.
3) The method of neutralization—whether the acid is added before the ammonia or simultaneously. T.V.A. workers have produced good suspension fertilizers without any clay by keeping the *p*H near 8.0 during neutralization.
4) The temperature attained during neutralization. If the temperature of the reacting ammonia and phosphoric acid reaches boiling or near boiling temperature, little suspension can be expected from the iron and aluminum phosphate precipitate.
5) The length of time the mixture is to be stored.

In general, when mixtures are to be stored less than one week, 20 pounds of clay per ton, on a dry basis, will be adequate. When the material is to be stored longer than one week, more than this amount will be needed. We have used up to 50 pounds per ton without causing the viscosity to become too high.

When high density materials, such as potassium-magnesium sulfate or potassium sulfate, are to be suspended, more clay will usually be required than is necessary to suspend lighter solids, such as potassium chloride.

When making attapulgite slurries, we prefer to use 13 parts of clay to 87 parts of water. This is thin enough to be handled without overloading equipment. When making bentonite slurries, we prefer 8 parts of bentonite to 92 parts of water.

The quantity of water necessary to disperse the clay limits the amount of water that can be added to the acid during neutralization. Therefore, it is sometimes necessary to add the clay-water slurry to the acid before neutralization in order to prevent overheating and in order to have enough liquid present to keep the mixture fluid. Otherwise, the reaction mass may "set up."

Frequently, it is desirable to reduce the viscosity of the clay-water suspension so that less power is required for adequate dispersion, or so that higher concentrations of clay may be mixed, or so that the pump for handling the clay-water slurry is not overloaded. This requires the use of a thinning agent. Tetrasodium pyrophosphate (T.S.P.P.) may be used in the proportion of 1 part to 500 parts of dry clay. Ammonia may be used as a thinning agent for attapulgite slurries but not for bentonite slurries. It is used in the proportion of 1 pound NH_3 to 26 pounds of dry clay.

PRACTICAL GRADES

I. The grades listed below have been successfully prepared in the laboratory, the pilot plant, or plant. Their fluidity, suspension quality, and percentage of coarse crystals are satisfactory. Supplemental nitrogen, when required, was furnished by ammonium nitrate-urea-water solutions.
   - A. Grades in which the K_2O is supplied by muriate of potash
     1) 12-12-12
     2) 16-8-8
     3) 5-15-15
     4) 2-6-18
     5) 8-16-16
     6) 14-9-7
   - B. Chloride-free grades in which the K_2O is supplied by sulfate of potash
     1) 4-8-12
     2) 5-10-15
   - C. Chloride-free grade in which the K_2O is supplied by mixtures of sulfate of potash and sulfate of potash magnesia
     1) 4-8-12
   - D. A no-phosphate, chloride-free grade, with 5% water soluble MgO made with K_2O from sulfate of potash magnesia
     1) 10-0-6-5

II. *Limitations*

In general, the total plant nutrient content upper limit appears to be about 40%, except in the case of 1:3:0 ratios.

The sum of the per cent nitrogen and per cent potash should not exceed 24.

These limits can be raised somewhat by using urea as the only source of supplemental nitrogen, or by using caustic potash as the source of K_2O, but to do so nullifies the advantage of the lower-cost wet process acid. If ammonia-ammonium nitrate-water solutions are used to furnish the nitrogen, the analyses will have to be somewhat lower. For example, an 11-11-11 is probably the upper limit of a 1:1:1 ratio when this source of nitrogen is employed.

Future research will undoubtedly raise these limits. ▲

Alphabetical List of Advertisers

EDITORIAL

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FCMS: ". . . the beginning of a very worthwhile program for the industry"

It was back in February that this editorial page posed the question: why does a salesman go to school? We wondered if it was because his sales manager twists his arm—or whether it is due to an earnest desire on his part for professional improvement. We concluded that each salesman probably would have a different answer to that one.

At that time we were writing about the first Fertilizer Salesmen's School ever sponsored by the NPFI, which was an immediate success. In fact, it was so successful that the Board of Directors voted to extend this worthwhile program to other areas of the country.

Last month in New York City, another group of people in the farm chemicals industry "went to school." And once again it was a "pilot" program called FCMS. We think these four letters have already left their mark on the Farm Chemicals industry. Of course, those letters stand for Farm Chemicals Marketing Seminar.

Could the sales manager, the advertising manager, the farm chemicals plant manager or other management people who attended FCMS give a definite answer as to why they "went to school" for those two days? We don't know—in fact, we aren't too concerned about *why* they attended.

However, we do have a gold mine of material concerning whether they were able to relate the information they received to their specific operations . . . whether they would attend a second FCMS . . . whether, after reporting home, they thought other members of their firms would benefit from a second FCMS . . . and on and on!

We've given you a report of FCMS on pages 16–19 of this issue. Now we'd like to share with you the reactions of those who attended the two-day meeting. We're doing it for a "selfish" reason: *we were so pleased with the general reaction that we're confident after reading this, you'll start thinking about attending next year's FCMS right now!*

We asked questions ranging from location of the meeting to the kind of service the hotel offered, but here were the *key* queries:

Question: From the total amount of information presented, were you able to *gain one or more ideas which in your opinion may be of value to yourself or your firm in the coming months?*

Answer: An unqualified *yes* from *every* "FCMS Critique" form returned to us!

We could almost stop right there and feel that we had achieved our purpose. How many meetings have you attended recently where you have returned with *one valuable idea?* How many meetings have you attended which left you with the thought that you could have spent your time more profitably back at your office?

Question: Would you be interested in attending a second FCMS?

Answer: Well, there's always "one in every crowd." An unqualified *yes* on every returned questionnaire—except one (no answer).

Question: After reporting home, do you believe other members of your firm would benefit from a second FCMS?

Answer: 78% yes; 9% no; 13% no answer.

What do these figures mean?

First, they indicate that this first FCMS meeting was a resounding success! We can't go into the other important phases of this questionnaire because space does not permit, but generally most speakers were well received. The questions were significant and well answered.

Of course, you can't please *all* the people. For example, there were several who disliked the questions. One participant made the recommendation that "someone should review the speeches beforehand and have pertinent questions prepared." He suggested that a panel do this.

Another interesting criticism was that Monday was a "poor day" to start a meeting—several people suggested that Tuesday be the starting day.

Second, these figures show that attendance at a second FCMS should be a whopper! One sales manager said: "Next year I would like to bring our 12-man sales force if a little more time would be devoted to sales profit relationship."

Another management man said he would estimate that 2 men from his office would attend, adding that "this is the beginning of a very worthwhile program for the industry."

A fellow who suggested that more emphasis be placed on pricing said he "would estimate that 10 people from his office would benefit from FCMS in 1960."

Average estimates were 4 men per office who would benefit from FCMS.

We'd like to close this "Summary of FCMS" with just one more comment from an active participant: "I think this should be an annual meeting."

Well, we don't think there's any doubt but what it will be!

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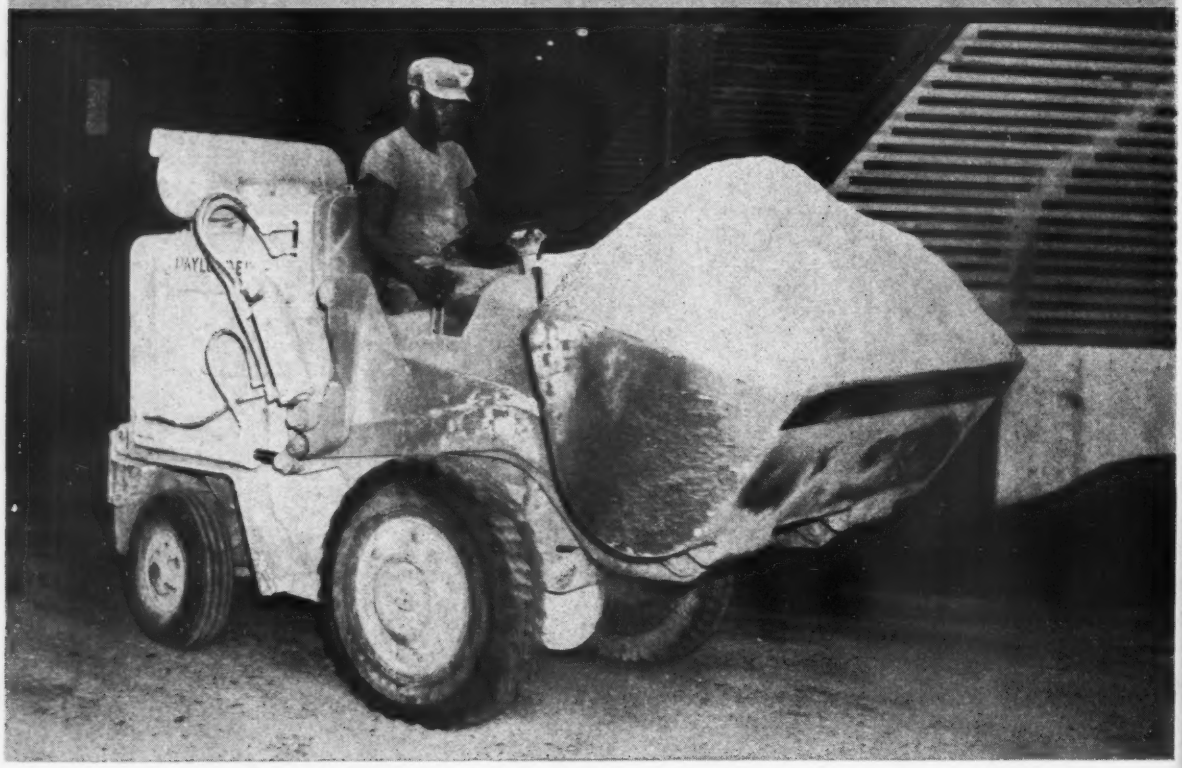

*Says Clyde T. Puryear, Plant Supt. of Hi-Acres, Inc., Fertilizer Division, Groveland, Florida, "the H-25 'PAYLOADER' is working out very satisfactory with faster cycles plus large load-carrying capacity. The power-shift transmission supplies accurate, smooth power to dig full bucket loads. It is well-balanced to handle the bucket load on fast delivery. There is no lost motion."

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